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American Journal
of
ORTHODONTICS

VOL. 35 SEPTEMBER, 1949 No. 9

Original Articles

ADDRESS OF WELCOME TO THE AMERICAN ASSOCIATION OF ORTHODONTISTS

WALTER H. WRIGHT, D.D.S., PH.D., NEW YORK, N. Y.

MR. PRESIDENT, Members, and Guests of the American Association of Orthodontists:

I am honored to welcome you to the forty-fifth annual meeting of the largest specialty of the dental profession in the greatest city of the best nation on earth.

If I were an historian, I should be unable in these few minutes to name all the illustrious persons who have contributed to the knowledge, skill, and culture to which you are heir. Their spirits are here today, and I honor them with a roll call of only a few of those who, before the beginning of this century, had laid the foundation of orthodontics. Fauchard, Bourdet, Hunter, Delabarre, Lafoulon, Kingsley, Farrar, Oppenheim, Guilford, Talbot, Jackson, Case, and Angle are names carved upon the cornerstone of your specialty, and they grace the bibliographies of your most erudite writings. It would be pleasurable to recount the deeds of those who have contributed to the art and science of orthodontics, but, in the midst of present realities, we dare not reminisce. The program before us represents the experience of years, the labors of many hands and minds, the mingling of genius, and the challenge of science.

You have come together to consider the widespread health needs of the present, and to plan for the future. You will have opportunity to renew old friendships and to make new acquaintances. This is even an occasion for fun and frolic. We offer a great city for your enjoyment and, above all, American freedom in which to enjoy it.

This is a momentous meeting of your association. In the past you have made an important contribution to child health, and now we confidently look to you for help amid the widespread need for orthodontic treatment which exceeds the present resources of our profession. There is increasing demand in

Presented at the meeting of the American Association of Orthodontists, New York, N. Y., May, 1949.

this specialty for postgraduate education which cannot be supplied. The growing need among public health agencies for qualified personnel is unfilled. Few dental schools are providing undergraduate training in this field and, withal, the public are seeking wider distribution of orthodontic care for their children. In this period of social unrest and political activity, all health agencies are being alerted to the increasing demand and the implication of such demands for widespread health services.

Orthodontists are well qualified to enter this new era with its increased demands. During the past one hundred years the principles and practices of orthodontics have been elaborated and proved, and you now have a sure foundation upon which to expand rapidly a service that will meet the public need. Research likewise is pointing the way to the prevention of dental deformities, and this area of your specialty deserves the wholehearted support of the profession and the public. The profession is aware of your continuing efforts to meet the growing demand for orthodontic services. These are exemplified by the work of your committees on education and public health, and momentarily by a study of orthodontics in relation to the dental curriculum which is being carried forward by members of this association.

There is evidence that you will not be found wanting. The vision, ability, and integrity of your leaders give the assurance that you are accelerating your progress toward the goal that was envisioned by those who founded your specialty. This meeting is evidence of your determination to improve all areas of your service in order to provide an increased dental care for our children. If I were a prophet, I should expect to see in the future a great multitude of children freed from the aberrations of growth, beautiful in countenance, symmetrical in features, with perfect occlusion such as we now dream about, and all singing the praises of orthodontics.

It is customary on such occasions as this to give you the key to the city. You will have no need of it, because New York is neither locked nor hidden behind an iron curtain. However, there is one key which all members of the profession possess. It is the key to dental health. May I urge you to use it continuously to unlock the treasures of health and happiness to those who, now and in the future, may seek the comfort and healing of your professional care. Use it diligently to remove the shackles of dental disease and deformity which cripple and disfigure our children. Use it courageously, in spite of limitations and disappointments, to open a greater future to our profession. Through your devotion and labors and with God's help, dentistry will continue to honor those who helped to build it, and to attract future generations who will cherish and serve it.

I bring from education, from the profession, and from the public a hearty welcome, together with praise and thanks for what you have done, and with confidence in the success of your continuing efforts to provide an increasingly widespread and effective oral health service for America's children.

FABRICATION OF SEMICONTOURED MOLAR LOOP BANDS FROM CHROME BANDING MATERIAL

E. E. JOHNS, D.D.S., KINGSTON, ONTARIO, CANADA

THE ease and accuracy with which Johnson molar loop bands may be quickly fitted are well known to those of us who have been using these bands in our offices. However, since then bands have been made of precious metal; it is impossible to spot-weld stainless steel to them, and it was felt that if these bands could be made in stainless steel it would not only materially cut the cost involved but would also make possible the spotting of flanged buccal tubes or intermaxillary hooks to these bands, thus eliminating the polishing necessary with soldering. A thinner band could be used also and still retain the necessary strength.

It was with this idea in mind that some experimenting was done to see if the advantages of the 0.008 Johnson molar loop band could be duplicated in stainless steel.

The material chosen was the Rocky Mountain dead soft chrome banding 0.006 or 0.005 inch thick by 0.180 inch wide, although any desired thickness or width of material may be used.

There is nothing difficult about the technique of making these semicontoured bands. With very little practice an assistant can make up 25 bands in an hour. One eight-foot roll of chrome banding material will produce 63 No. 2 bands. These bands have now been in use for the past year and seem to meet all requirements. Several other staff members of the Department of Orthodontics of the Faculty of Dentistry, University of Toronto, are making their own molar loop bands and seem to be encountering no difficulty.

There are five steps in the procedure:

1. Cutting the material into the correct lengths.
2. Spot-welding into ring formation by lap joint.
3. Stretching the center of the band with the band stretchers.
4. Rolling the edges down with band stretchers and band rollers.
5. The formation of the loop at the lap joint.

A brief description of the band stretchers and rollers may be helpful (Fig. 1). The stretchers are used to stretch the middle part of the band. When the handle on the threaded shaft is turned clockwise, the tapered shaft is drawn through, thus spreading the split portions of the stretchers and at the same time stretching the center part of the band. There are five different locations on the stretchers for the five sizes of bands. However, it was found that before the

Presented as a Table Clinic at the New York meeting of the American Association of Orthodontists, May 6, 1949.

Fig. 1.

Fig. 2.

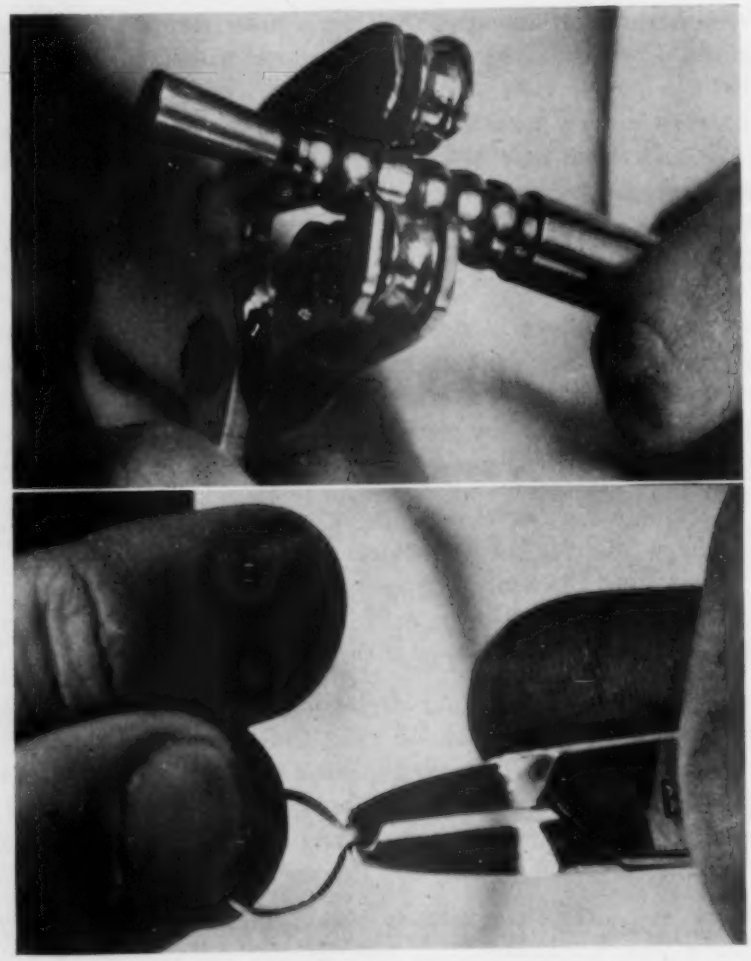


Fig. 3.

outside edge of the band was adapted against the stretchers, the band usually broke due to the extreme force. For this reason the band rollers were designed to contour the outside edges of the band against the stretchers. The rollers are made with concave wheels to fit the convex surface of the stretchers accurately.

The first step is to cut the banding material into the correct lengths to give the five sizes of finished bands. These lengths are kept in separate containers so that they may be spot-welded and contoured during slack periods.

LENGTH OF MATERIAL IN MM.	SIZE OF BAND	
35		No. 0 (for deciduous molars)
37	Small	No. 1 (for permanent molars)
39	Medium	No. 2 (for permanent molars)
42	Large	No. 3 (for permanent molars)
44	Extra large	No. 4 (for permanent molars)

These lengths in millimeters are stamped on the handle of the stretcher for permanent record (Fig. 1). Each of these five lengths of flat banding material is then stamped with its correct number (0 to 4), indicating the size of the band. Usually a series of one size is made up at one time. Size 2 or 3 will fit the majority of permanent molars.

The second step is to spot-weld the bands into the ring formation by four or five welds on the 1 mm. lap joint. The original lengths were made just long enough to compensate for this 1 mm. overlap. The lap should then be polished with a rubber abrasive wheel.

The third step is to stretch the center part of the band by placing it on its corresponding number on the stretcher. Make sure that the cylindrical band is on the center of the convex surface of the stretcher. A few clockwise turns of the handle will stretch the center of the band.

The fourth step is to complete the contouring of the band by rolling the outside edges of the band down by means of the roller. A few turns with light pressure will accomplish this (Fig. 2). Too much pressure must not be used as it will force the band into the longitudinal crevices on the stretcher, leaving marks on the band. Also if too much pressure is used the temper will be partially restored to the dead soft banding material, making it hard to adapt the band on the tooth later. The handle is now turned counterclockwise, allowing the split portion of the stretcher to contract, permitting removal of the semicontoured band.

The last step is the formation of the loop at the lap joint. This is accomplished by placing a 1½ inch nail (0.075 diameter) or a suitably sized wire underneath the lap joint (Fig. 3) and pinching the band over it into a loop by the regular molar loop-pinching pliers (Baker No. 33).

These bands are fitted in the mouth the same as the regular loop bands. However, after the band has been adapted and the loop pinched, the pinched portion is flattened against the buccal surface before the band is removed from the tooth. This will permit spot-welding of the band, resulting in a join which is almost unbreakable.

The stretchers and rollers illustrated were machined by J. P. Foster, 18 Thomas Street, Kingston, Ontario.

221 King Street, East.

HEAD GROWTH OF THE MACAQUE MONKEY AS REVEALED BY VITAL STAINING, EMBEDDING, AND UNDECALCIFIED SECTIONING

ALTON WALLACE MOORE, D.D.S., M.S.,* SEATTLE, WASH.

I. INTRODUCTION

AMONG the earliest methods destined to be utilized in growth studies of the head was that developed by the physical anthropologists who employed certain points, planes, and angles in attempts to describe racial differences. These methods were ultimately adapted to growth studies where sufficient material of different age groups was available. The work of Hellman (1927, 1933) is outstanding in this field. He not only investigated large series of Indian crania, but also later applied the same techniques to living individuals. Goldstein (1936) and Davenport (1940) did similar and equally important work on the living. In 1922, Keith and Campion attempted an analysis of the growth of the head by comparing, bone for bone, three crania representing different age stages. Krogman (1930) published an exhaustive series of comparative studies on the higher anthropoids and man.

In 1931, Broadbent described his technique of controlled roentgenology of the head, and in 1937 published findings gained from cross-sectional studies of large groups of growing children. Brodie (1941) published findings based on a longitudinal study of growing males by means of the Broadbent apparatus. All of the above might be classified as gross quantitative studies since neither the dried bone nor the x-ray shadow reveal growth sites.

Studies of bone as a tissue have witnessed the employment of microscopy, experimental embryology, and vital staining. In the last named area, Belchier (1736) was one of the first, if not the first, to call attention to the fact that bone had a peculiar affinity for madder, an organic dye. To Duhamel (1739), however, should go the credit for proving that only growing bone had this characteristic. It was he who first described the manner of growth of bones. Hunter (1771) applied the same method to a study of the growth of the mandible in the pig, and very accurately described the sites of growth of the body of this bone as well as that of the alveolar process associated with the eruption of the teeth. Brash (1924, 1934) repeated Hunter's work, again using the pig, and came to similar conclusions regarding the mandible. He extended his investigation to include the upper face and brain case and insisted that all of the growth of these parts was due to surface apposition and resorption. He denied the suture any role in the process.

Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Orthodontia in the Graduate School of the University of Illinois, 1948.

Read at the meeting of the American Association of Orthodontists, New York, N. Y., May, 1949; awarded first prize in the essay contest sponsored by the American Association of Orthodontists, 1949.

*Associate Professor and Executive Officer of the Department of Orthodontics, University of Washington.

The difficulty of inducing animals other than swine and fowl to take madder mixed with their food led to a search for a substitute that could be administered hypodermically. This was found in the form of alizarin, one of the derivatives of madder and now available in the synthetic form known as alizarin red S. This material has been employed by Schour (1936), Levine (1940), and Massler (1941) to study the head growth of rabbits, rats, and monkeys.

In studies of bone where vital staining has been employed, it is not possible to decalcify the specimen because the dye is lost. It is necessary, therefore, to content oneself with an examination of surfaces unless some sort of sectioning is employed, and such sectioning, albeit of a crude nature, has been used for the study of compact bones by even the earliest investigators. Since it was the purpose of the present investigation to study the delicate internal bones of the face, it was necessary to employ means that would maintain the relationships of such structures during the cutting process.

Techniques applicable to the embedding of the undecalcified bone in a hard substance that would permit sectioning or surface grinding have been described by numerous authors. Hibbens (1937), Knight (1937), Puckett (1940), Strumia and Hershey (1944), Technical Service Report of E. I. Du Pont de Nemours & Co. (Inc.) (1945), Moore (1946), and Kampmeier and Haviland (1948) have all described the use of either ethyl or methyl methacrylate as suitable embedding media. No reference could be found describing the method of sectioning used in this study.

II. MATERIAL AND METHODS

A. Material.—The specimen used for this study was a female Macaca rhesus monkey with a dental age comparable to a 5-year-old human being. The macaque was the animal of choice because the findings would be more applicable to human growth. The specimen was obtained from the Department of Histology of the University of Illinois, College of Dentistry.

The first injection of alizarin red S was made on Jan. 9, 1940, at 3:00 P.M. The monkey was given 10 c.c. of 2 per cent alizarin red S intraperitoneally. On Feb. 9, 1940, at 10:30 A.M., a second injection of 12 c.c. of 2 per cent alizarin red S was given intraperitoneally. The monkey was sick after the last injection, lost weight, and was sacrificed on Feb. 16, 1940, seven days after the last injection. Excretion of the alizarin red S in the feces had stopped. Autopsy revealed adhesions in the abdominal cavity.

B. Methods.—The most satisfactory material found for embedding was unpolymerized methyl methacrylate monomer. The inhibitor was removed from the monomer and an accelerator was added by methods previously reported. The technique found to be most satisfactory for embedding the skull in this material was the partial prepolymerization of the methyl methacrylate into two different consistencies in a water bath at 85° C.; one, a thin solution having the consistency of glycerine, and the other, a thick solution having the consistency of very heavy molasses. The thin solution kept under refrigeration indefinitely, while the thick solution had to be used immediately after preparation.

The skull was prepared for embedding by cutting it in half along the midsagittal plane. The cut surface of the skull was placed face down in a

glass vessel and centered in relation to the surrounding walls of the vessel. It was completely covered with the thin, partially prepolymerized monomer, subjected to vacuum for five to ten minutes, and then allowed to stand with a loose-fitting cover at room temperature (not over 70° F.) for twenty-four hours. The specimen was then covered to an excess of one inch with thick, partially prepolymerized monomer to displace the thin monomer, and was left at room temperature (not over 70° F.) for forty-eight hours or until the thick monomer was completely hardened. The thin monomer was still fluid and was decanted at this time. In another twenty-four hours the surface was completely hardened. The final stage consisted of annealing the block in an oven at 50° C., to prevent checking or crazing. This technique differed from others previously described only in the manner of embedding.

The sectioning of the block was the next consideration. The use of a band or circular saw was discarded because of the impossibility of obtaining perfectly parallel cuts and the destruction of part of the specimen. The method finally selected was that of sectioning by surface cutting, although this necessitated the photographing of each successive surface so that a record of each cut could be saved.

The outer surface of the prepared block was cut parallel to the midsagittal plane of the skull and mounted with methyl methacrylate on the face-plate of a screw cutting lathe. The specimen was mounted on a face-plate to insure its return to the same position for further cuts after it had been removed for polishing. A carbide-tipped tool (Carmet, style 0-51, Allegheny Ludlum Steel Corporation) was found to cut enamel, bone, and embedding medium with equal ease. A special camera mounting was made to fit the bed of the lathe in order that serial cuts could be photographically recorded at the same degree of magnification.

The lathe was set for automatic cross feed to insure a smooth cut. It was found that as little as 0.01 inch could be removed by each cut but not more than 0.02 inch. After each cut the block was polished with decreasing grits of wet-dry sandpaper (No. 360, No. 420) and then removed from the lathe for the final polishing with a buff wheel to which Bendick polishing stick had been applied. The photographic record was taken after the block had been replaced on the lathe (Fig. 1).

Each cut was photographically recorded on 3¼-inch by 4¼-inch Kodak Commercial Ortho film. The double extension bellows of the camera were employed for maximum magnification. Whenever a cut showed significant differences from the previous cuts, an Ansco color film transparency was made.

For the purpose of evaluation and illustration, an enlarged print was made from each black and white negative. The prints for which there were duplicate Ansco color films were traced with black India ink to outline the cut portions of the skull. The areas showing stain in the color transparencies were indicated with red India ink stippling on the prints, the heavier the stain the heavier the stippling. The halftone was then washed from the prints with potassium ferricyanide, leaving a line drawing with stippling.

Massler observed in his study of the cranial vault of the rat that there are two periods of bony growth:

1. A period of generalized bony growth from birth to about 60 days of age, which is characterized by the active deposition of bone upon all bony surfaces. The rate of growth at different sites is, however, different. This period is thus characterized by a very rapid increase in the size of the cranial vault with concomitant changes in proportions due to differences in the rate of growth at the different sites.

2. A period of localized growth after 70 days of age which is characterized by the fact that bone deposition occurs only at certain sites of growth. These sites are in general the same that showed the most rapid rate of growth during the previous period. Since growth is confined to localized areas the predominant characteristic of this period is a marked change in the proportions in the cranial vault with only a relatively slight increase in size.

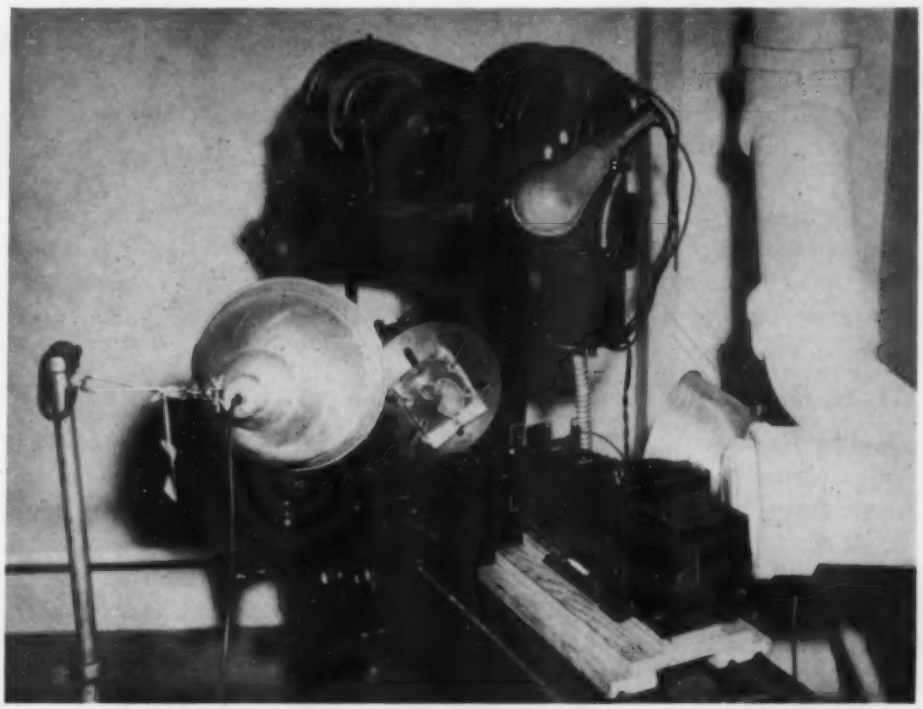


Fig. 1.

The specimen used in the present experiment was entirely pink before embedding; however, the localized or more active growth sites were stained more deeply. After the specimen had been embedded, the generalized pink coloration had been lost and it appeared as though only the more active growth sites retained their stain. This selectivity of the methyl methacrylate for the more heavily stained areas was probably due to its slightly acid reaction which removed the superficial stain but did not affect the stain in the more heavily deposited areas.

Before analyzing the findings it is necessary to discuss briefly the interpretation of growth sites in bone as revealed by vital staining. The following points should be kept in mind:

1. Alizarin will be deposited in any tissue that is calcifying at the time of the injection. Bone that is calcifying will be pink; however, bone that is not calcifying or is resorbing at the time of the injection will not show any coloration.

2. In the growth of bones there is not only an increase in size but a constant change in the internal architectural structure; both processes require the laying down of new bone tissue. It is frequently difficult to differentiate clearly between the two. We were primarily interested in size increases.

3. There are four general areas in which bone growth may occur:

a. Periosteal.
b. Sutural.
c. Endochondral.
d. Endosteal.

4. Stain occurring in bones developing by periosteal, sutural, or endochondral growth may generally be taken to indicate increase in size, whereas that occurring within the trabecular framework may be assumed to be due to developmental changes of the internal structure.

III. FINDINGS

Upon gross examination of the specimen after embedding, many sites of active growth were evident. All sutures were examined by transmitted light and showed evidence of very heavy staining. We shall describe the specimen by areas.

A. *Staining Revealed by Gross Examination.*—

1. *The Brain Case.*—The entire external surface of the cranium (Fig. 2) exclusive of the base and parts of the hafting zone of the face were unstained, although there was a faint coloration of the supraorbital ridges. On the other hand, all of the sutures, coronal, lambdoidal, and temporal, showed unmistakable evidences of the dye. For the most part this could not be localized in either of the abutting bones. The base of the skull (Fig. 4) revealed heavy staining of the occipital condyle, body of the sphenoid bone, and adjacent area of the basilar part of the occipital bone. The tip of the petrous portion of the temporal bone, the infratemporal surface of the great wing of the sphenoid bone, and the jugular process of the occipital bone were also deeply stained.

In contrast to the selective staining of the exterior of the brain case was the generalized staining of the internal surface. Here the dye was found on the surfaces of all the bones of both vault and base.

2. *The Face.*—The most striking area of the face (Fig. 3) was the premaxilla. This bone is separate in the monkey at this age and apparently enjoys a prolific, independent growth. The suture separating it from the maxilla was sharply defined, indicating no growth of the adjacent surface of that bone. Dye was seen, however, on the maxillary sides of the frontonasal and the maxillozygomatic sutures, as well as over the entire area of the tuberosity (Fig. 2). The orbit showed some evidence of coloration, but the bones comprising this cavity are so delicate that this might have been reflection from other parts. The free margin of the alevolar process was stained.

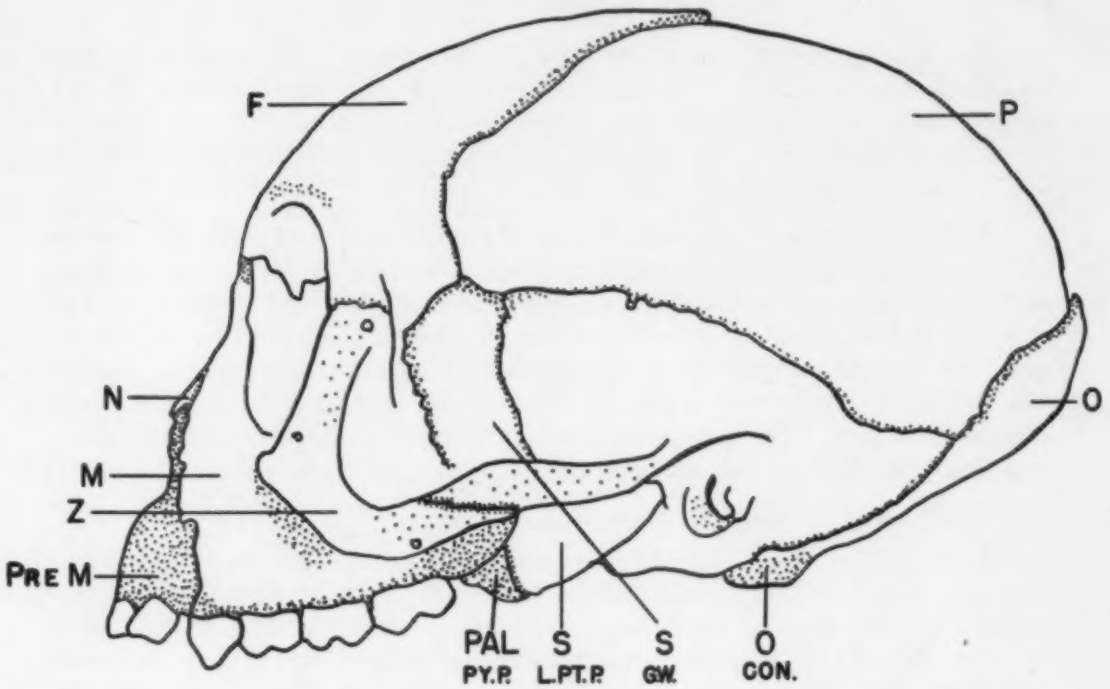


Fig. 2.

Figs. 2-15.—*F*, Frontal bone; *M*, maxilla; *M F.P.*, frontal process of maxilla; *N*, nasal bone; *O*, occipital bone; *O CON.*, condyle of occipital bone; *O J.P.*, jugular process of occipital bone; *P*, parietal bone; *PAL*, palatine bone; *PAL PY.P.*, pyramidal process of palatine bone; *PRE M*, premaxilla; *PRE S*, presphenoid; *S*, sphenoid bone; *S B.*, body of sphenoid bone; *S G.W.*, great wing of sphenoid bone; *S L.PT.P.*, lateral pterygoid plate of sphenoid bone; *S M.PT. P.*, medial pterygoid plate of sphenoid bone; *T*, temporal bone; *T PET.*, Petrous portion of temporal bone; *T SQ.*, squamous portion of temporal bone; *Z*, zygomatic bone.

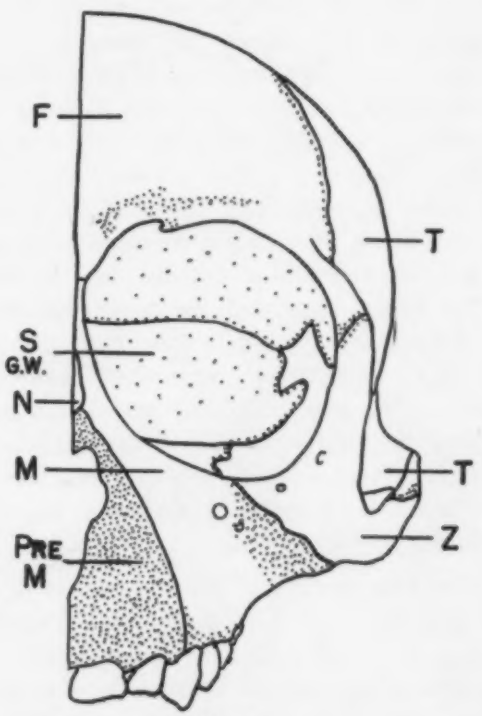


Fig. 3.

The palate, viewed from below (Fig. 4), showed no dye except in its premaxillary element and in the transverse suture. In the latter location the dye seemed about equally distributed on both sides, i.e., in maxilla and palatine bones. The main portion of the horizontal process of the palatine bone and its entire posterior margin were unstained.

3. *The Craniofacial Hafting Zone.*—The great wing and pterygoid process of the sphenoid bone, the pyramidal process of the palatine bone, and the zygomatic arch are considered the hafting bones between face and cranium. All of these showed evidences of growth. Although most of the lateral surface of the great wing was unstained, its margins, posterior, anterior, and superior, showed well-defined staining. The zygomatic arch showed faint staining on all laterally directed surfaces. The pterygoid process, and particularly the medial plate, was deeply stained, as was also the pyramidal process of the palatine bone.

B. *Staining Revealed by Sectioning.*—

1. *The Brain Case.*—The first prepared cut of the specimen is graphically shown in Fig. 5. This reveals again a generalized staining of the entire inner surface of the bones of the cranial vault and in the coronal and lambdoidal sutures. In only one area of the vault, viz., the supraorbital, did the stain extend completely through the bone, and it will be recalled that the external surface in this area had exhibited coloration. The presphenoid, sphenoid, and abutting basilar portion of the occipital bones were deeply dyed throughout.

Successive cuts, illustrated by Figs. 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15, indicated much the same pattern as that shown by Fig. 5. The coloration in the supraorbital region continued throughout, and the staining of the vault bones seemed to extend further toward the external surface with each succeeding cut. It should be pointed out, however, that as each cut was made the surface of the cut became more oblique and hence would tend to give this impression.

The base of the cranium showed the same distribution of the dye as that of the first cut until the plane of the occipital condyle and the pterygoid process was reached (Fig. 7). This revealed that growth was occurring at both of these areas, although the superior surface of the occipital bone around the foramen magnum no longer showed the dye. All sections containing the occipital condyle (Figs. 7, 8, 9, and 10) showed this structure to be growing, principally on its inferior surface. The great wing and the pterygoid process of the sphenoid bone lost much of their internal stain as the cuts progressed laterally (Figs. 7, 8, 9, 10, 11, 12, and 13), although the cranial surface was never free of it.

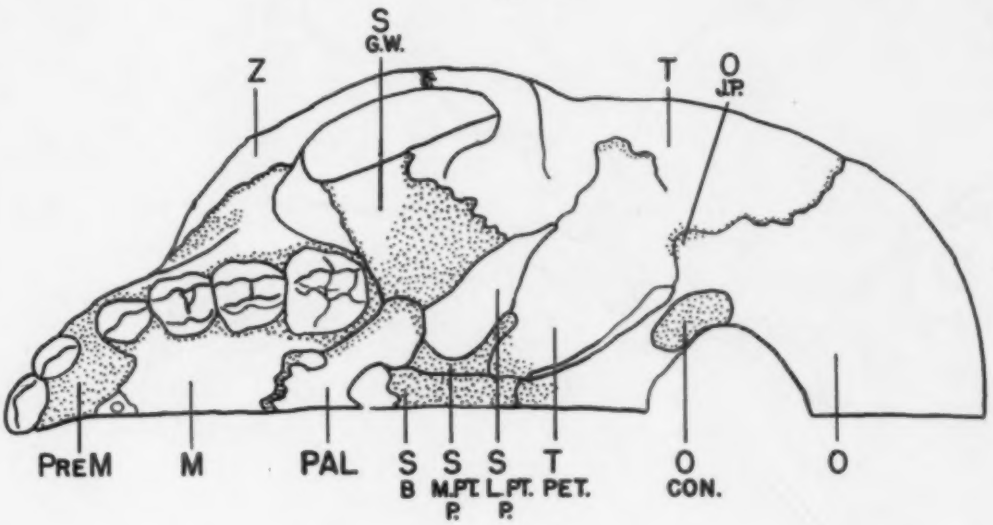
The petrous part of the temporal bone was first seen in cut No. 13, represented in Fig. 7, lying between elements of the sphenoid and occipital bones. This cut traversed its tip which showed deep staining throughout. Fig. 8, which represents the eighteenth cut, revealed no stain whatsoever in the petrous element nor was it seen in any succeeding cut.

2. *The Face.*—The first section of the specimen was quite close to the midline but slightly to the side of the nasal septum (Fig. 5). In addition to the generalized staining of the premaxilla previously noted, there was heavy staining of the hard palate except on its inferior aspect, and the maxillopalatine suture was deeply colored. The spongy portion of the frontonasal process of

the maxilla exhibited some of the dye, but its junction with the frontal bone was lost.

Fig. 6 represents the sixth cut and now the orbit had been opened and the inferior nasal concha had been cut. The frontonasal process of the maxilla showed dye in its trabeculated portion, and the maxillary and palatine portions

Fig. 4.



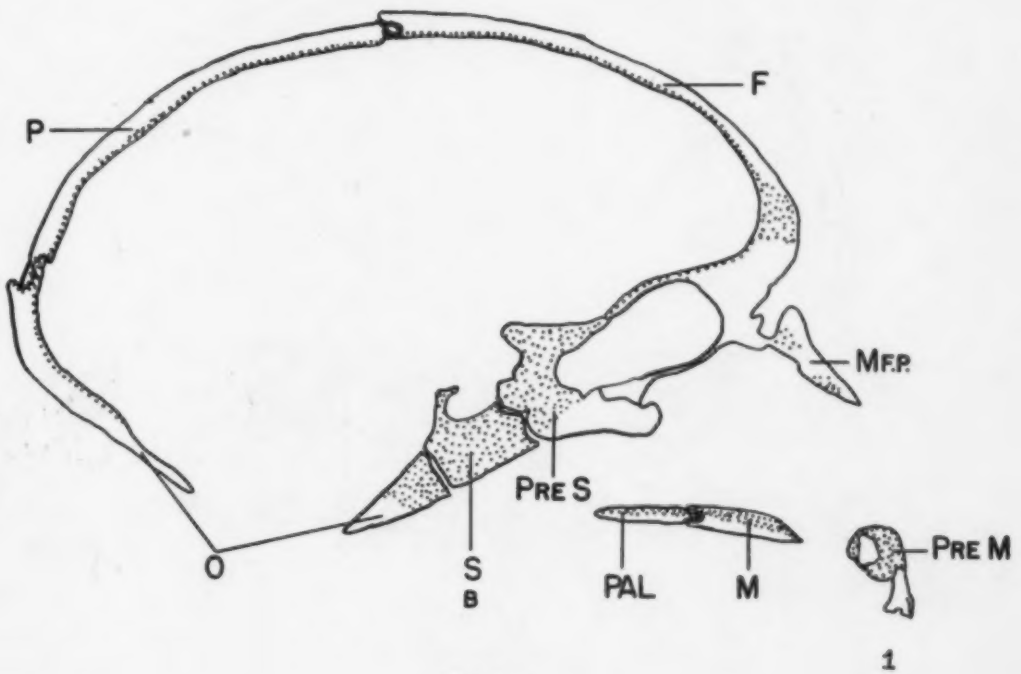
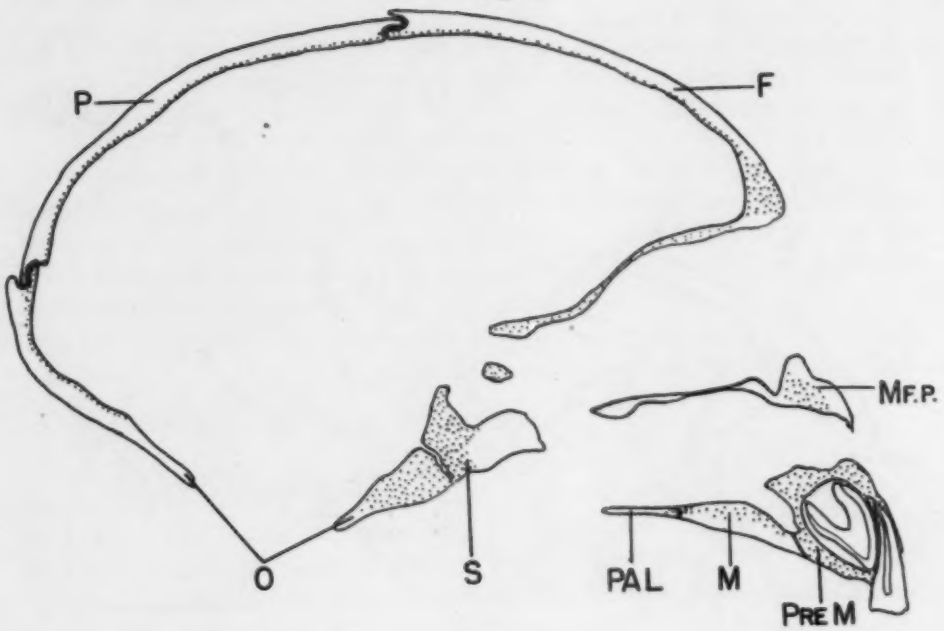


Fig. 5.

Fig. 6.



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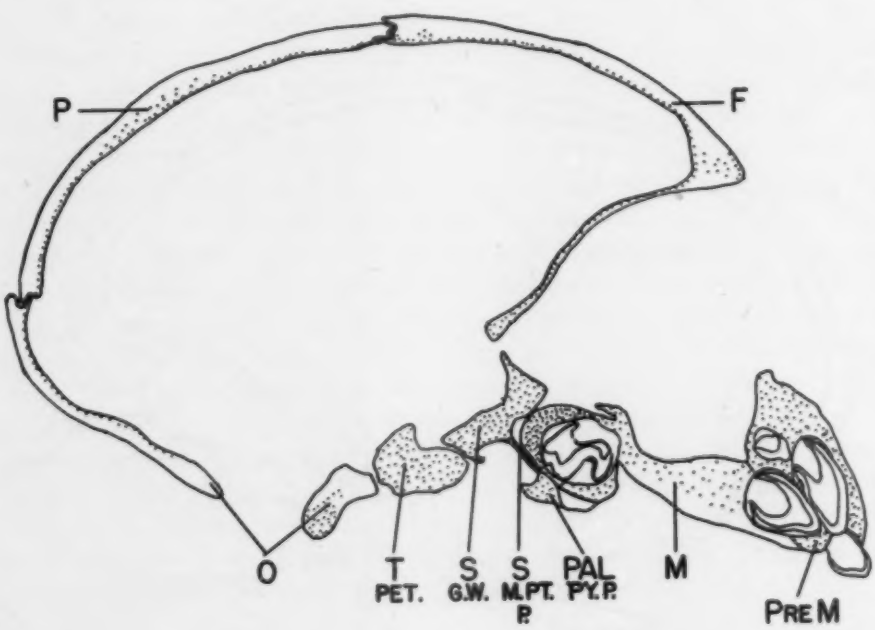

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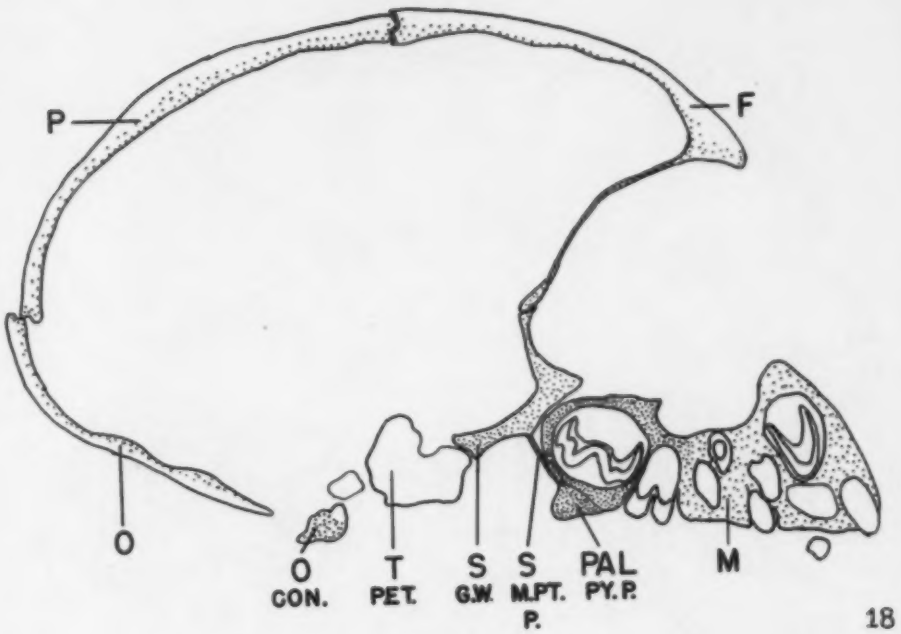
Fig. 7.

Fig. 8.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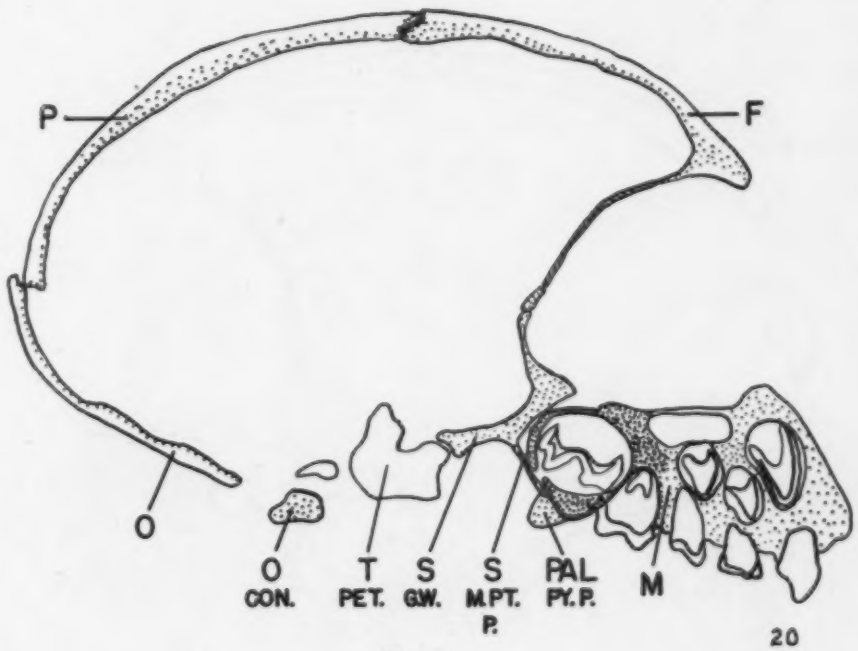
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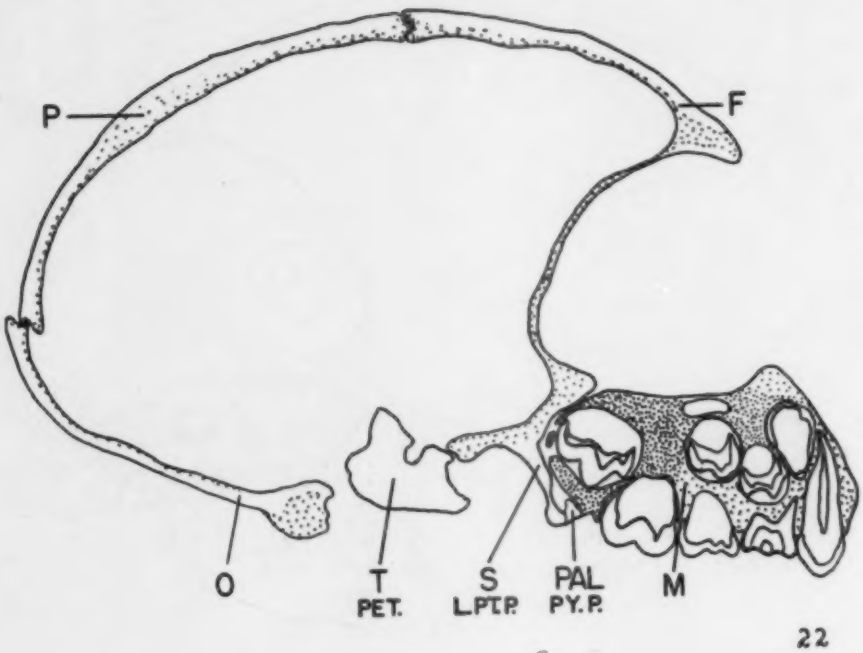
Fig. 9.

Fig. 10.



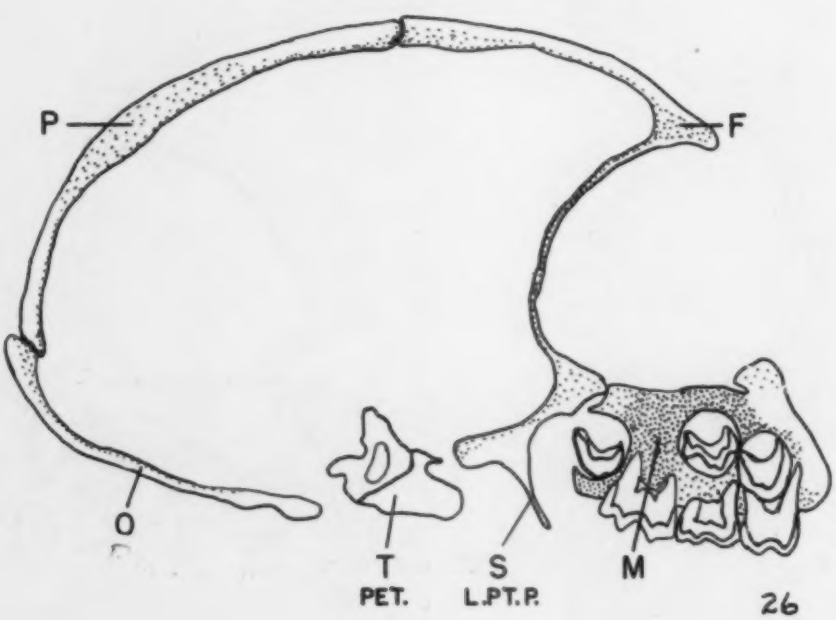
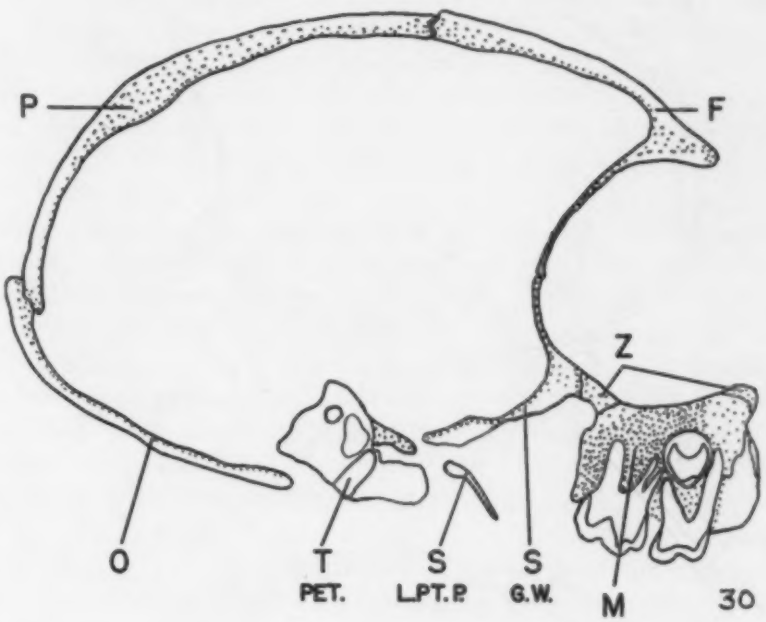


Fig. 11.

of the hard palate continued to exhibit the dye on the superior surface. This cut was far enough laterally to traverse the centers of the deciduous central incisor and the germ of its permanent successor. No other teeth were exposed.

By the thirteenth cut (Fig. 7), the germs of the two permanent incisors and the canine were visible anteriorly and the germs of the first permanent molar posteriorly. Subsequent cuts illustrated in Figs. 8, 9, 10, 11, 12, and 13

Fig. 12.



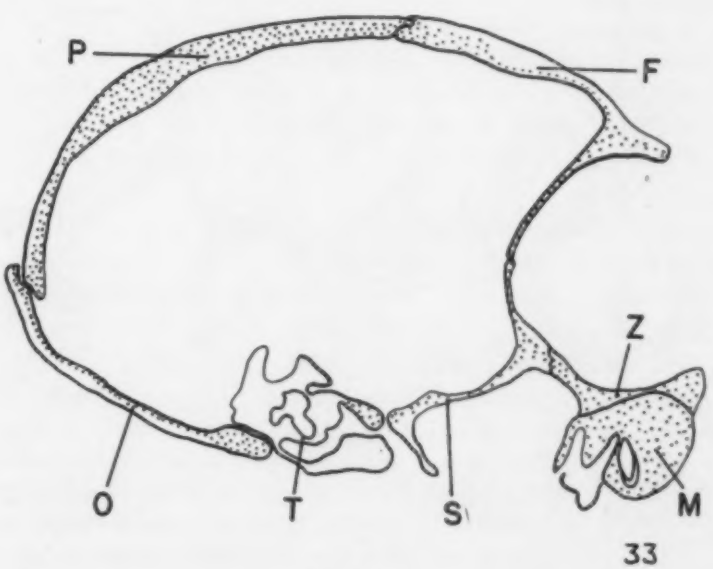
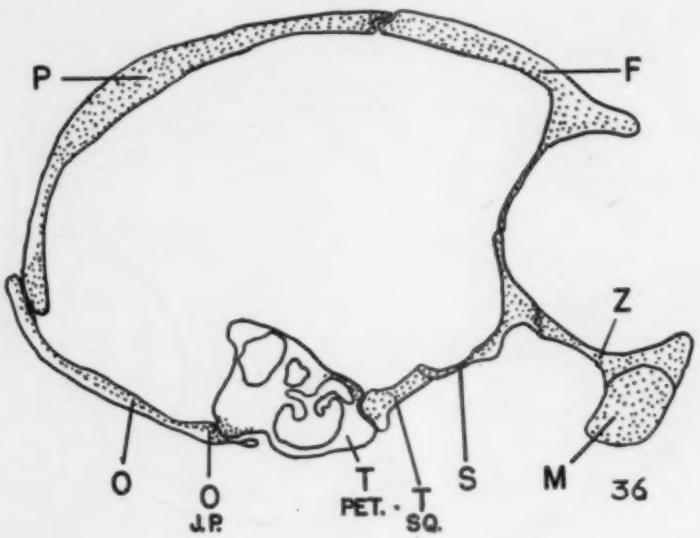


Fig. 13.

revealed the deciduous teeth and their permanent successors. All of these exhibited essentially the same conditions, viz., a generalized staining throughout the maxilla with the dye becoming more intense toward the back, i.e., around the housing of the permanent molar. The pyramidal process of the palatine bone was likewise heavily stained.

Fig. 14.



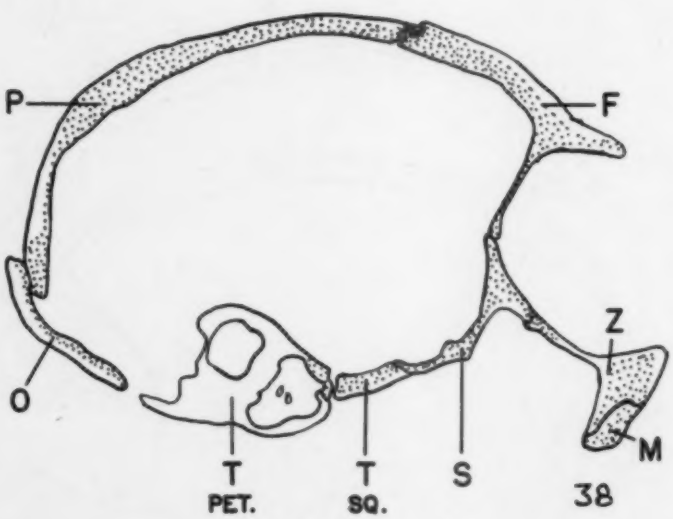


Fig. 15.

IV. DISCUSSION

The madder feeding of pigs led Brash to conclude that the greater part of head growth could be credited to surface accretion and absorption mechanisms. He wrote: "I think there can be no doubt that the amount of bone added to the skull, and to the facial bones, by surface addition is very much greater than the

amount added at suture lines, and I am led to the conclusion that the growth units are the bones themselves and not the sutures that unite them." His illustrations of sagittal and frontal sections bear out this conclusion as far as the brain case is concerned, but it should be pointed out that the brain of the pig completes its growth at an early age and the remaining growth of this part consists of a laying on of surface bone that markedly increases its thickness and provides its characteristic bony prominences.

Hauschild (1921), Bernstein (1933), Massler (1941), and the present work all indicate that the suture is the primary site of brain case enlargement. The fact that the outer table of the skull was completely unstained while the internal table carried the dye and the sutures were deeply stained led to the conclusion that growth at the sutures would result in overenlargement of the brain cavity were it not for a concomitant deposition on the internal table slowly increasing the thickness of the bones of the vault.

The bones comprising the base of the skull from the foramen magnum forward to the ethmoid bone presented quite a contrast. In this area there appeared to be a generalized increase in size since the dye was found on all surfaces as well as throughout the internal framework. Formerly thought of as interstitial growth this internal staining is now believed to be indicative of the increase in size of the trabecular pattern. Such intense growth activity in the basal area is otherwise hard to explain in the face of Brodie's measurements of the human male from the third month to the eighth year of life. He showed that the increase in the distance from the center of sella turcica to the spheno-occipital junction was but 4 mm. on the average, and that from the same point to the sphenoethmoidal junction was but 5 mm. Thus the sphenoid body which was 27 mm. at three months added only 9 mm. to its anteroposterior length in eight years.

The inertness of the petrous part of the temporal bone was striking. Only its tip showed the dye. This was believed to be an accompaniment of the gradual withdrawal of this part from the interval between the basilar part of the occipital bone and the posterior margin of the great wing of the sphenoid bone as the temporal bone was carried laterally by growth. Growth at the tip of the petrous portion of the temporal bone would be necessary to maintain its relationships.

The distribution of dye in the facial part of the specimen did not agree with the findings of Brash in this area. He concluded that growth in the height of the face was brought about by simultaneous deposition on the inferior and resorption on the superior surfaces of all horizontally disposed partitions such as the floor of the orbit, maxillary sinus, and nose. Here again he denied the sutures any significant role. His illustrations, however, showed deep staining of the maxillopremaxillary suture, both bones being involved, and of the frontonasal suture. His specimen showed the same heavy staining of the maxillary tuberosity or "alveolar bulb" and of the transpalatal suture as did the monkey. However, Brash demonstrated deposition of bone on the inferior surface of the palate, whereas the monkey exhibited dye on the superior surface or nasal floor. Some of these differences can be reconciled by an analysis of the differences between the two species studied.

In the pig the maxillopremaxillary and frontonasal sutures lie in the horizontal plane and thus their activity would lead to increase in the anteroposterior depth of the face or "snouting." The activity of the maxillopremaxillary suture is generally held to be associated with the development of the diastema and the eruption of the maxillary canine, while the frontonasal suture would contribute to the total anteroposterior dimension of the face.

In the monkey there has occurred a marked change in the orientation of face to cranium. The brain case in this animal, as in man, is above the face rather than behind it and the snout has retreated. The frontonasal suture now contributes to vertical height of the face rather than to horizontal length. It will be recalled that the dye was found on the maxillary side of this suture. This would seem to imply an upward growth of the maxilla against a relatively fixed base resulting in a downward thrust of the maxilla. If this be accepted, a logical explanation of the staining of the floor of the nose and the orbits is gained.

The maxilla contributes a large part of both the nasal and orbital floors, and any descent of this bone would lead to an equal descent of all of its parts. To state the matter differently, the height of the nose and of the orbit would increase by the same amount as that of new bone added at the frontonasal suture. But the orbits are nearly of adult size at birth, and it has been demonstrated by Brodie that the proportions of facial parts do not change from birth onward. Deposition on the floors of these cavities would be necessary to maintain these proportions, i.e., to prevent their overenlargement.

In the anteroposterior or depth growth of the monkey face the mechanism seems similar to if not identical with that found in the pig. The tuberosity of the maxilla abuts against the pterygoid process of the sphenoid bone and the pyramidal process of the palatine bone is caught between the two. That there is prolific growth of the tuberosity has been accepted by all investigators since John Hunter. This growth, occurring against the relatively fixed pterygoid buttress, results in a forward pushing of the face. The amount of such forward movement may be augmented by the growth behavior of the pterygoid process, and this seems to be a species characteristic. Brash's illustrations of the pig showed heavy staining of the pterygoid process which would seem to indicate a forward movement of this part. The monkey specimen showed slightly less staining here, but enough to indicate some activity. Longitudinal studies of the human being (Ortiz, 1945) indicated that no forward movement of the pterygoid process occurred beyond the first year or two of life.

Our findings on the palatine bone seem to corroborate the postulate of Brodie (1938) relative to the role of this bone. He pointed out that the pyramidal process, caught as it was between the maxillary tuberosity and pterygoid process of the sphenoid bone, prevented the palatine bone from sharing in the forward movement of the maxilla. Such movement of the latter bone, unaccompanied by that of the palatine bone, would tend to open the transverse suture of the palate unless bone were added at that site. It will be recalled that the inferior surface of the horizontal process of the palatine bone and its entire posterior free margin were unstained, but that alizarin was found on both sides of the suture. In an effort to determine approximately how much of

this adjustment was made by the maxilla and how much by the palatine bone the hard palates of ten adult skulls and the radiographs of ten newborn children were measured. The average total length of the palate of the newborn children was found to be 30.36 mm. as against 50.93 mm. in the adult. Of these dimensions the palatine bone contributed 7.28 mm. and 15.76 mm., respectively. Thus the palatine element of the hard palate, although doubling its own size, contributed only 8.48 mm. against 12.09 mm. contributed by the growth of the posterior margin of the maxillary element. This would account for the slow forward migration of the suture, previously noticed by other investigators who had sought to relate it to the teeth. By this mechanism the posterior border of the horizontal process of the palatine bone maintains a relatively constant anteroposterior relationship to the nasal and oral pharynx during growth.

The decided evidence of stain on the maxillary side of the zygomaticomaxillary suture was taken as further evidence of the upward and backward growth of the maxilla against the cranium and its supporting buttresses. This suture is oblique to the other two, i.e., the frontonasal and the maxillopterygoid, and hence its direction represents the resultant of their growth force. The presence of dye in the zygomaticotemporal suture and on both sides of the suture indicated that both were contributing to the anteroposterior growth of the zygomatic arch. Broadbent pointed out that serial studies of the human being showed that this suture lies in the same plane as do the coronal and pterygomaxillary, and that this plane represents that of least alteration during human head growth.

No sections were made of the frontal planes of the head, and it is therefore impossible to comment on growth in width. The gross specimen, however, exhibited the dye on the lateral aspect of the zygomatic arch and on the lateral aspect of the pyramidal process of the palatine bone. The dye present on the periphery of the great wing of the sphenoid bone in the temporal fossa was interpreted as an adjustment to maintain the position of this part to the lateral aspect of the brain case.

The heavy internal staining of the maxilla was assumed to be related to tooth formation and eruption. The premaxilla, crowded as it was at this age with the deciduous teeth and their larger successors, was stained internally and externally. The tuberosity was similarly deeply stained throughout with the intensity greatest around the developing germ of the permanent first molar. The dye was not so apparent in the premolar area at this age, probably because the permanent teeth are little if any larger than their deciduous predecessors and hence require less bone alteration.

V. SUMMARY AND CONCLUSIONS

1. A method of embedding and sectioning undecalcified bone and teeth has been described.

2. The specimen used for this study was a female Macaca rhesus monkey with a dental age comparable to a 5-year-old human being. It had been vitally stained with alizarin red S.

3. The methyl methacrylate used as an embedding medium removed the generalized stain of the specimen and left only the more active or heavily stained areas.

4. The universal occurrence of dye in the sutures was a strong indication to us that these structures, rather than the bones themselves, were the primary agents of growth. Just as the proliferation of cartilage cells in epiphyseal plates has come to be regarded as the main contributor to growth of the long bones, we believe that the proliferation of connective tissue in the sutures is responsible for the enlargement of the head bones.

5. The generalized staining of the internal table of the cranium indicated that as the vault was increased in size by growth at the margins of the bones their thickness was increased by internal deposition.

6. The generalized staining throughout the bones comprising the base of the cranium was not attributed so much to a general increase in size as to changes in internal architecture.

7. The staining that was present at the tip but at no other place in the petrous part of the temporal bone is further evidence that this bone is carried laterally by growth. Without growth at the tip of its petrous element this part would be withdrawn from the angular interval between the basi-occipital and great wing of the sphenoid bone.

8. The distribution of dye in the facial skeleton of the monkey, although very similar to that described by Brash for the pig, led to quite different conclusions than those reached by that investigator. These differences can be largely explained on the basis of the dissimilarity in the disposal of the facial sutures in the two animals. Because of the differences in craniofacial relations, the same sutures that produce the long snout of the swine are responsible for much of the height of the face of the monkey.

9. In the monkey the upper face grows in height primarily by an upward growth of the frontonasal process of the maxilla. A concomitant deposition of bone on the floors of the orbit and nasal cavity maintains their proportionality by preventing their overenlargement.

10. Growth of the face in a forward direction was shown to be due to the backward growth of the tuberosity of the maxilla against a relatively fixed base, the pterygoid process of the sphenoid bone, resulting in a forward positioning of the maxilla. This mechanism seems to be common to swine, monkey, and man.

11. The importance of the pyramidal process of the palatine bone lies in the fact that, caught as it is between the maxillary tuberosity and pterygoid process of the sphenoid bone, it prevents the palatine bone from moving forward with the maxilla. This would result in an opening of the transverse suture of the palate were it not for proliferation of new bone in the suture. Thus the posterior border of the horizontal process of the palatine bone maintains a relatively constant anteroposterior relationship to the nasal and oral pharynx during growth.

12. The heavy internal staining of the maxilla and premaxilla was assumed to be associated with the development of the dentition. The growth of the succedaneous teeth and of the molars which have no predecessors would necessitate rapid alterations in the internal architecture of these parts.

The general conclusion that seems to be indicated by this study is that the connective tissue system, by its proliferation at certain sites, leads to the marginal growth of the bones. Some of these sites lead to enlargement and are

located predominantly in sutures. Other sites, some of which are sutural and others surface, act as adjustors by (1) maintaining contact of bones that would otherwise be separated or by (2) preventing the disproportionate enlargement of such cavities as the brain case, orbit, and nose.

REFERENCES

Belchier, J.: Communication to the Royal Society, Phil. Trans. **39**: 287, 1736.

Bernstein, Sidney A.: Ueber den normalen histologischen Aufbau des Schädeldaches, Ztschr. f. Anat. u. Entwcklngsgesch. **101**: 652-678, 1933.

Brash, J. C.: The Growth of the Jaws and Palate, London, 1924, Dental Board of the United Kingdom.

Brash, J. C.: Some Problems on the Growth and Developmental Mechanics of Bone, Edinburgh M. J. **41** (n.s. IV.): 305; 363, 1934.

Broadbent, B. H.: A New X-ray Technique and Its Applications to Orthodontia, Angle Orthodontist **1**: 45-66, 1931.

Broadbent, B. H.: The Face of the Normal Child, Angle Orthodontist **7**: 209-233, 1937.

Brodie, Allan G.: Biologic Aspects of Orthodontia, Chapter in Gordon, S. M.: Dental Science and Dental Art, Philadelphia, 1938, Lea & Febiger, pp. 176-218.

Brodie, Allan G.: On the Growth Pattern of the Human Head From the Third Month to the Eighth Year of Life, Am. J. Anat. **68**: 209-262, 1941.

Davenport, C. C.: Post-natal Development of the Head, Proc. Am. Phil. Soc., vol. 83, no. 1, 1940.

Duhamel, H. L.: Sur une Racine qui teint les os en rouge, Communication to the French Academy of Science, 1739.

Goldstein, M. S.: Changes in Dimensions and Form of the Face and Head With Age, Am. J. Phys. Anthropol. **22**: 37-90, 1936.

Hauschild, M. W.: Histologische untersuchungen ueber normale und abnorme synostose der hirnschadelnahte, Verhandl. der Anat. Ges. (bound in Anatomischer Anzeiger) **54**: 85-93, 1921.

Hellman, M.: A Preliminary Study in Development as It Affects the Human Face, Dental Cosmos **69**: 250-269, 1927.

Hellman, M.: The Face and Teeth of Man; A Study of Growth and Position, J. D. Res. **9**: 179, 1927.

Hellman, M.: Growth of the Face and Occlusion of the Teeth in Relation to Orthodontic Treatment, Int. J. Orthodontia **19**: 1116, 1933.

Hibbens, J. H.: The Preservation of Biological Specimens by Means of Transparent Plastics, Science **86**: 247-248, 1937.

Hunter, John: Natural History of the Human Teeth, London, 1771, J. Johnson.

Kampmeier, O. F., and Haviland, T. H.: On the Mounting of Anatomical Museum Specimens in Transparent Plastics, Anat. Rec. **100**: 201-232, 1948.

Keith, A., and Campion, G.: A Contribution to the Mechanism of Growth of the Human Face, Int. J. Orthodontia **8**: 607-633, 1922.

Knight, Henry G.: The Preservation of Biological Specimens by Means of Transparent Plastics, Science **86**: 333-334, 1937.

Krogman, W. M.: The Problem of Growth Changes in Face and Skull as Viewed From a Comparative Study of Anthropoids and Man, Dental Cosmos **72**: 624, 1930.

Levine, Philip: Certain Aspects of the Growth Pattern of the Rabbit's Skull as Revealed by Alizarine and Metallic Implants, University of Illinois M.S. thesis, 1940.

Massler, M.: The Growth Pattern of the Cranial Vault in the Albino Rat as Measured by Vital Injections of Alizarine Red S, University of Illinois M.S. thesis, 1941.

Moore, A. W.: An Accelerated Method of Embedding Anatomical Specimens in Methyl Methacrylate, J. D. Res. **25**: 157, 1946.

Ortiz, M. H.: On the Growth of the Human Head From Birth to the Third Month of Life, University of Illinois M.S. thesis, 1945.

Puckett, W. O.: The Methacrylate Plastics as Mounting Media for Biological Materials, Science **91**: 625-626, 1940.

Schour, I.: Measurements of Bone Growth by Alizarine Injections, Proc. Soc. Exper. Biol. & Med. **34**: 140-141, 1936.

Schour, I., Hoffman, M. M., Sarnat, B. G., and Engel, M. B.: Vital Staining of Growing Bones and Teeth With Alizarine Red S, J. D. Res. **20**: 411-418, 1941.

Strumia, Max, and Hershey, J. Ivan: A New Method for Preservation of Human and Animal Tissues by the Use of a Transparent Plastic, Science **99**: 105-106, 1944.

Technical Service Report No. 4: Embedding Specimens in "Lucite" Methyl Methacrylate Resin, Plastics Department, E. I. Du Pont de Nemours & Co. (Inc.), Arlington, New Jersey, 1945.

Weinmann, J. P., and Sicher, Harry: Bone and Bones, St. Louis, 1947, The C. V. Mosby Company.

A STUDY OF BACTERIAL COUNTS (LACTOBACILLI) IN SALIVA RELATED TO ORTHODONTIC APPLIANCES

A Preliminary Report

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THE orthodontist is constantly being asked by the parents of prospective patients, "Will braces cause my child to have more cavities?" This question is easily answered by a definite "No." Braces do not cause cavities. But when the wording of the question is, "Will wearing braces increase the incidence of dental caries?" one immediately starts thinking of statistical evidence to verify his answer.

By virtue of the fact that they offer retention areas for food accumulation, it cannot be denied that orthodontic appliances make more difficult the maintenance of good mouth hygiene, the retention of food being influenced by the number and type of bands, arch wires, and attachments.

A search of the literature does not reveal satisfactory statistical information with reference to caries activity in the mouths of children during the time orthodontic appliances are worn. Prompted by this deficiency, a private research project was instituted in an attempt to answer this often-asked question. To be of value, a statistical study must include a sufficient number of cases and must cover a prolonged period of time. The period of time was arbitrarily set at some three to five years, and the number of cases was determined to a great extent by the ability to accumulate and record data satisfactorily, consistent with the carrying of a definite patient load.

In view of scientific evidence, it can be assumed that caries of the enamel is principally a process of decalcification resulting from the acids of bacterial activity in carbohydrate food debris. In the beginning of this century, the association between lactobacilli and dental caries was noted by Goadby.[1] In 1915, Kligler also called attention to the relationship between lactobacilli and carious teeth.[2] In 1917 Howe and Hatch reported that when carious cavities were sealed for varying periods so that saprophytic organisms would be eliminated and the organism which is responsible for the lesion would survive, cultures constantly revealed *Lactobacillus acidophilus.*

Between 1920 and 1930, several investigators began to use an acidifying medium on the assumption that caries was produced by acids and that the organisms responsible for its production should be able to survive and carry out their life process in an acid environment. These studies revealed the consistent presence of *L. acidophilus* in carious mouths and its absence from the oral cavities of persons resistant to dental caries. The introduction of an immediate quantitative laboratory test by Hadley, Bunting, and Delves in 1930[3] provided a mechanism to determine caries activity at any given time by the presence of *L. acidophilus.* Its application was first tested by Bunting and Palmerlee[4] and Jay and Voorhees[5] and confirmed by Becks,[6] Enright,

This thesis was written and submitted to the American Board of Orthodontics in partial fulfillment of the requirements for certification.

Frisell, and Trescher[7] and Thompson.[8] In 1933 Hadley[9] described a method for determination of the *L. acidophilus index*. Hadley's method has been employed with minor modifications in this study.

In a *L. acidophilus* index study by Becks, Jensen, and Millan[10] on a group of 1,250 cases showing rampant caries and a group of 265 cases of caries-free individuals, they conclude the following:

> The contrast between the two groups demonstrates a definite relationship between the presence and absence of Lactobacillus acidophilus in caries activity and inactivity respectively. Although there are the acidogenic micro-organisms which may play a similar role, Lactobacillus acidophilus is consistently found whenever a state of rampant caries exists, and is absent during caries inactivity. Therefore, the presence of Lactobacillus acidophilus constitutes a significant index and establishes this index as a qualified laboratory indicator for diagnosis and prognosis of this disease.

The association between *L. acidophilus* and caries activity is now firmly established, and although the association does not establish *L. acidophilus* as a specific etiological factor, the presence or absence of these organisms from the oral cavity can be accepted as valid evidence of caries activity. This acceptance is confirmed in that health departments in many states are providing facilities for saliva cultures to determine caries susceptibility of specimens sent in by dentists of their state.

A study made by Burrill[11] on the effects of orthodontic treatment on caries susceptibility revealed that extremely susceptible patients become less susceptible during treatment; patients of low susceptibility tended to become more susceptible; a third group of high average susceptibility was unpredictable, changes in the counts occurring in both directions. This was a preliminary report on twenty-five patients and the data was not complete.

With this evidence, it was assumed that *L. acidophilus* counts could be used as a test in measuring caries activity, and, therefore, the influence of orthodontic appliances on *L. acidophilus* counts would be a valuable study.

These experiments were begun in August, 1947, so that sixteen months is the longest period of observation covered in this preliminary report. In the selection of children for the study, an attempt was made to select those whose homes were within a radius of thirty miles of the city of Charlotte, North Carolina, so that they could be easily recalled in the event a specimen was lost or destroyed in the mails, as was often the case. Children with an average D.M.F.[12] rate were chosen. No data of the diet habits of the children were secured; however, it can be assured that they were as diverse as in any similarly uncontrolled group of children. The influence of the diet on *L. acidophilus* counts was not discussed with the parents or the child, in order to avoid a deliberate change. The procedure was explained on the basis of a study for research purposes. All of the children were selected from private practice, and came from middle and upper middle class income groups. Saliva specimens were obtained on two successive days before orthodontic appliances were placed, and following each visit for adjustment, which was approximately every three weeks. The two initial saliva specimens were collected in the office. The procedure of collection was described in detail to the child and the parent, who sent subsequent samples directly to the laboratory in

mailing tubes provided. These specimens were collected in the morning before breakfast and before brushing the teeth or drinking any water. The patient was instructed to chew vigorously a 2 Gm. piece of paraffin, first on one side of the mouth and then on the other, and to expectorate all accumulating saliva into a sterile bottle until between 5 and 10 c.c. were collected. The bottle was placed in a mailing container and mailed to the laboratory.

All specimens were mailed from Charlotte, North Carolina to St. Louis, Missouri, a distance of approximately 730 miles, and the time involved was from twenty-four to forty-eight hours.

The laboratory procedure in the quantitative estimation is similar to that described by Hadley.[9] The specimen is thoroughly shaken and diluted to a concentration of 0.1 c.c. or 0.01 c.c. with glucose acid broth. This amount is then spread evenly over Kulp's (modified) tomato agar (*p*H 5)* plate with a curved glass spreader. After a four-day incubation period, the number of organisms per cubic centimeter of saliva is estimated by multiplying the number of *L. acidophilus* colonies on the plate by ten, if the concentration is 0.1 c.c., or by one hundred if the concentration is 0.01 c.c.

The bacteriologic procedures were carried out in the laboratory of Dr. H. T. Knighton,[13] Professor of Bacteriology and Pathology, Washington University School of Dentistry, St. Louis, Missouri. The samples were sent in with numbers, and no reference was made to the history or the type of case. The reports were sent back to this office on the form below:

NO. OF LACTOBACILLUS PER C.C. OF SALIVA

Case No._____Date received_____

Dr._____Lab. No._____

No. of Lactobacillus_____

No. of Yeast-like organism_____

Misc. _____

Snyder _____

Dept. of Bact.

The lactobacillus count was used in the study and is the criterion in the tabulation of results. Dr. Knighton was interested in the number of yeastlike organisms found, since he has done considerable research in yeastlike organisms found in human saliva.[14] Under "Miscellaneous" was included an estimation of organisms other than *L. acidophilus* or yeastlike that happened to appear on the media. These additional organisms were used as an index to contamination, and if the number was more than one hundred or two hundred, the sample was not recorded. The most common organism appearing was a

*Media can be secured from Difco Laboratories, Detroit, Michigan, and is prepared as follows:

Mixture A: Add 10 Gm. Difco peptone and 10 Gm. Difco peptonized milk to 400 c.c. juice filtered (through cotton) from a good quality of canned tomatoes. Heat gently to dissolve the peptone and peptonized milk. Unnecessary heating of the tomato juice should be avoided. The reaction of the solution is adjusted to *p*H 5.0 with lactic acid.

Mixture B: Add 25 Gm. dried agar to 600 c.c. distilled water and autoclave to dissolve the agar. Just before removing B from the autoclave, bring A to the boiling point. Then mix A and B while both are hot, and filter through a thin layer of absorbent cotton. Distribute in containers and sterilize by heating in the autoclave at 120° C. for eight minutes. The properly prepared medium is a clear agar, of a light brown color, having a final reaction of *p*H 5.0.

gram-negative rod.[15] Snyder's test was used as a check on the *L. acidophilus* count,[16] although the results are not included as records.

Snyder's test was performed in the laboratory by adding 0.2 c.c. saliva directly to tubes of melted medium at 45° C. This medium* is a dextrose infusion agar (*p*H 5.0) containing bromcresol green as an indicator. The tubes are solidified and incubated for four days with daily observation. The color reactions induced by bacterial action range from no alteration to the bluish-green color through stages to a distinct yellow. The results are recorded as follows:

\- no color change for 96 hours.
\+ positive color reaction in 48-96 hours.
++ positive color reaction in 24-48 hours.
+++ positive color reaction in 12-24 hours.

It should be mentioned that Snyder's test can easily be performed in the dental office to determine caries susceptibility. From all reports in dental literature, and from the author's experience with several hundred saliva samples, there is a very close correlation between the number of lactobacilli as counted on tomato agar plate and the color reaction in the Snyder's test. The color change in this test can easily be demonstrated to the patient and therefore has certain educational advantages.

The three main types of orthodontic appliances used on patients in this study are: (1) labial and lingual arch appliances; (2) Angle edgewise appliance with modification, according to Tweed and Strang; (3) Johnson twin-wire appliance.

Labiolingual appliances consisted of banding upper and lower six-year molars, using precious metal material and with the use of a base metal arch wire with precious metal attachments and auxiliary springs.

The edgewise arch appliance consisted of banding all teeth with precious metal bands, with the general exception of the twelve-year molars. The arches used were of stainless steel wire, both round and rectangular, and occasional brass hooks and spurs.

The Johnson twin-wire mechanism consisted of a twin-wire alignment arch of 0.010 and 0.011 and occasional ribbon arches, all of steel, drawn in steel shafts. In all instances this appliance was used in conjunction with labial and lingual arches in the lower arches, as described under labiolingual appliances. In no instance was the edgewise arch used in conjunction with the twin-wire or labial and lingual in any of the reported cases.

In Table I, the case number is for this report, and was not necessarily that assigned to the patient at the beginning of the sampling. The case number is all that is sent to the laboratory. This factor was considered desirable by Dr. Knighton, since he did not wish to have any history on the patients that might serve as an influencing factor in the counts. Malocclusion is classified according to Angle's classification. The types of appliances are those previously described or their combinations as indicated. The heading, "Number of Teeth With Bands at the Beginning" represents the total number of teeth

*This medium can be obtained from Difco Laboratories, Detroit, Michigan, in dehydrated form, or already prepared in screw top tubes under the name bromcresol green dextrose agar.

TABLE

SEX	CASE NO.	AGE	TYPE MALOC-CLUSION	TYPE APPLI-ANCE	DECAYED MISSING D.M.F. FILLED	NO. TEETH WITH BANDS AT BEGIN-NING	L.A.COUNT BEFORE APPLIANCES IN THOUSANDS 1ST	2ND	3	6	9	12
1	M.	12	CL. I	U.T.W. L.L.L.	9	8	0	1.2	0.25	–	–	12.5
2	F.	13	CL. I	U.T.W. L.L.L.	5	8	2.25	0.5	1.5	1.0	10.0	15.0
3	M.	12	CL. I	U.T.W. L.L.L.	4	8	2.2	0.25	87.5	50.0	64.5	25.0
4	M.	13	CL. II	U.T.W. L.L.L.	15	8	95.0	50.0	10.0	20.0	95.0	100.0
5	F.	13	CL. II	U.T.W. L.L.L.	9	8	2.5	1.5	1500.0	420.0	560.0	843.0
6	F.	12	CL. I	U.T.W. L.L.L.	7	8	10.0	1.1	10.5	5.0	29.0	190.0
7	M.	11	CL. I	U.T.W. L.L.L.	7	8	120.0	57.0	20.0	110.0	100.0	87.0
8	M.	11	CL. I	M.B.	7	20	280.0	50.0	140.0	122.5	600.0	510.0
9	F.	13	CL. II	U.T.W. L.L.L.	13	18	489.0	179.0	150.0	416.0	97.0	243.0
10	M.	14	CL. I	M.B.	23	20	10.0	25.0	175.0	78.0	200.0	194.0
11	M.	13	CL. III	M.B.	7	20	5.0	15.0	55.0	75.0	126.0	183.0
12	F.	13	CL. II	U.L.L. L.L.L.	10	4	33.0	10.0	365.0	50.0	95.0	46.0

U.T.W. = Upper twin wire.
L.L.L. = Lower labial and lingual arches.
M.B. = Multiple bands (edgewise arch appliance).
U.L.L. = Upper labial and lingual arches.

with bands at the beginning of treatment, no distinction being made between anterior or posterior bands, nor the type of attachment on the bands.

The D.M.F.[12] represents the number of teeth *D*ecayed which can be filled; *M*issing (extraction required or extracted previously); *F*illed adequately. In the majority of cases at the time of the first sampling before appliances, there were no decayed teeth, since all cavities had been previously discovered and filled. When appliances were placed, there were no decayed teeth, unless by accident caries was overlooked in several previous examinations.

It will be noted that there are some vaccines in the *L. acidophilus* counts after appliances were placed. These vacancies represent samples that were destroyed in the mails or were not obtained, due to broken appointments.

The end column, entitled "Total Band Months at Last Sampling" is determined by the procedure of one tooth with one band for one month being equal to one band month. Therefore, this represents the total number of teeth with bands multiplied by the total number of months the band has been in place.

An analysis of the results shown on the table will reveal that in all cases after orthodontic appliances have been placed, there is a general increase in the number of *Lactobacilli* in the saliva. There are definite deviations in successive three-week samplings from high to low counts; however, the general trend is upward. In the cases where the preappliance samplings are low, the rise in lactobacillus counts does not appear to be as rapid as in cases in which the preappliance counts are high. As is to be expected, there is a correlation between the lactobacillus counts and the D.M.F. rate. It appears that after

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L. A. COUNTS AFTER APPLIANCES (IN THOUSANDS) WEEKS														TOTAL BAND MONTHS AT LAST SAMPLE
15	18	21	24	27	30	33	36	39	42	45	48	51	54	
15.8	100.0	80.0	125.0	90.0	150.0	207.0	25.0	100.0	120.0	150.0	100.0	95.0	110.0	150
10.7	15.3	20.0	31.0	10.0	42.0	75.0	56.0	20.0	10.0	50.0	62.0	48.0		96
78.2	45.0	58.0	100.0	82.0	125.0	110.0	200.0	94.0	62.0	180.0	110.0	170.0	224.0	150
20.0	86.0	150.0	128.0	119.0	78.0	200.0	171.0	100.0	183.0	210.0	300.0	100.0		96
200.5	158.0	425.0	480.0	95.0	–	943.0	126.0	458.0	529.0	196.0	148.0	622.0		96
–	210.0	28.0	59.0	128.0	170.0	304.0	4.97	–	583.0	100.0	–			88
193.0	88.0	59.0	120.0	97.0	400.0	290.0	700.0	492.0	300.0	640.0	120.0	460.0		96
180.0	290.0	460.0	550.0	200.0	700.0		300.0	422.0	560.0	320.0	710.0			220
82.0	200.0	46.0	810.0	79.0	50.1	620.0	193.0	460.0	780.0					80
173.0	420.0	481.0	240.0	872.0	444.0									160
220.0	113.0	343.0	149.0	198.0	240.0	58.0	300.0							180
18.0	115.0	105.0	75.0	23.0	125.0	55.0	175.0							36

the counts reach a total above 10,000 c.c., they do not have a tendency to drop below this count.

While the evidence for this series of cases is not conclusive, there is sufficient indication from other cases on which samples are being run that the following preliminary conclusions can be made:

1. The presence of orthodontic appliances in the mouth does increase the lactobacillus count.

2. The degree of increase is dependent somewhat upon the number of bands.

3. There is a correlation between the total band months and the number of lactobacilli per c.c.

This study is continuing in the author's office with approximately sixty cases now being sampled. As the study progresses, many interesting possibilities are being brought to light, and it appears that at the end of five yeras sufficient data will be accumulated to be of real significance to the field of orthodontics and generally as related to the caries problem. One of the problems that the project will face in the future is the planned fluorination of the Charlotte, North Carolina, city water supply, which will interfere with some cases now under study and will make it necessary to select out-of-town patients for future study.

Since the lactobacillus counts serve as a reliable index of the bacteriologic flora of dental caries, this study has indications that the environmental factors of dental caries activity are modified in the mouths of patients with orthodontic appliances. This is partly due to the increased areas of food accumulation and acid production afforded by bands, attachments, and arch wires necessary for the appliances.

It is definitely established that fewer carious dental cavities occur in persons with low lactobacillus counts, so that it becomes of utmost importance that the orthodontist carefully evaluate the present status of caries control. Among the hopeful procedures that should be made available to patients with orthodontic appliances are:

1. Dietary control by prescribing for a period of two to six weeks a low carbohydrate diet. Since the carbohydrate intake bears a direct relationship to caries, it has been established that temporary reductions in carbohydrates will reduce lactobacillus counts over lengthy periods of time.

2. The use of fluorides in the communal water supply offers definite encouragement. A consistent finding in the epidemiologic studies of dental caries has been the very low frequency of high saliva lactobacillus counts in fluoride areas.

3. Topical use of sodium fluoride has been proved a prophylactic measure against caries and confirmed by extensive clinical experience.[17, 18]

4. Ammonia preparations, such as dibasic ammonium phosphate, used as a dentifrice and as a paste to be applied to the teeth just before bedtime and left without rinsing the mouth have been shown to cause a marked reduction in the oral lactobacillus counts.[19]

5. Salts of silver and other chemicals as suggested by Gottlieb[20] and others for impregnation to protect the enamel from invasion of microorganisms.

REFERENCES

1. Goadby, K. W.: Micro-organisms in Dental Caries, Dental Cosmos **42**: 201, 1899.
2. Kligler, I. J.: A Biochemical Study and Differentiation of Oral Bacteria With Special Reference to Dental Caries, J. Allied Dent. Soc. **10**: 141, 1915.
3. Hadley, F. P., Bunting, R. W., and Delves, E. A.: Recognition of Bacillus Acidophilus Associated With Dental Caries, J. Am. Dent. A. **17**: 2041, 1930.
4. Bunting, R. W., and Palmerlee, Faith: The Role of Bacillus Acidophilus and Dental Caries, J. Am. Dent. A. **12**: 381, 1925.
5. Jay, Philip, and Voorhees, R. S.: Bacillus Acidophilus and Dental Caries, Dental Cosmos **69**: 977, 1927.
6. Becks, Hermann: Salivary and Bacteriological Considerations in Control of Dental Caries, J. Am. Coll. Dent. **9**: 184, 1942.
7. Enright, J. J., and Frisell, H. E., and Trescher, M. O.: Studies of Cause and Nature of Dental Caries, J. D. Res. **12**: 759, 1932.
8. Thompson, Richard: Aciduric Organisms in Dental Caries, Proc. Soc. Exper. Biol. & Med. **29**: 103, 1931.
9. Hadley, F. P.: Quantitative Method for Estimating Bacillus Acidophilus in Saliva, J. D. Res. **13**: 415, 1933.
10. Becks, Hermann, Jensen, A. L., and Millan, C. B.: Rampant Dental Caries: Preventions and Prognosis; a Five-year Clinical Survey, J. Am. Dent. A. **31**: 1198, 1944.
11. Burrill, D. Y.: Effect of Orthodontic Treatment on Caries Susceptibility, J. D. Res. **20**: 253, 1941.
12. Collins, S. D.: Frequency of Dental Services Among 9,000 Families, Based on Nation-wide Periodic Canvasses, 1928-31, Pub. Health Rep. **54**: 629, 1939.
13. Knighton, H. T.: Evaluation of Quantitative Estimation of Lactobacilli in Saliva, Washington Univ. Dent. J. **13**: 126, 1947.
14. Knighton, H. T.: A Study of Monilia and Other Yeastlike Organisms Found in the Oral Cavity, J. D. Res. **18**: 103, 1939.
15. Knighton, H. T.: Personal correspondence.
16. Snyder, M. L.: A Simple Colorimetric Method for the Diagnosis of Caries Activity, J. Am. Dent. A. **28**: 44, 1941.
17. Knutson, J. W., and Armstrong, W. D.: The Effects of Topically Applied Sodium Fluoride on Dental Caries Experience, Pub. Health Rep. **58**: 1701, 1943.
18. Knutson, J. W., and Armstrong, W. D.: The Effect of Topically Applied Sodium Fluoride on Dental Caries Experience. II. Report of Findings for the Second Study Year, Pub. Health Rep. **60**: 1085, 1945.
19. Kesel, R. G., O'Donnell, J. F., Kirch, E. R., and Wach, E. C.: Ammonia Production in the Oral Cavity and the Use of Ammonia Salts for the Control of Dental Caries, Am. J. Orthodontics and Oral Surg. **33**: 80, 1947.
20. Gottlieb, Bernhard: Dental Caries, Philadelphia, 1947, Lea & Febiger.

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ORTHODONTIC EDUCATION

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THE day has arrived when much more and better academic training in orthodontics is essential for adequate practice. As taught in our universities and dental colleges, in graduate or postgraduate courses, orthodontics today is becoming more valuable and more effective in producing efficient and highly trained men who are taking up orthodontic practice as a specialty.

The problem of orthodontic education must be considered under three divisions; the undergraduate, the graduate, and the postgraduate levels. Some authorities say that there is not time for adequate instruction at the undergraduate level, and that orthodontics should be reserved for graduate courses. Others maintain that it can be taught in as satisfactory a manner as prosthetics, if given the same attention and time. Still others claim that orthodontic education is basic, and if instruction is coordinated and properly integrated it will not only improve the level of dental education, but also will make it possible to instruct the undergraduate student to the point where he is as adequately trained in orthodontics as in oral surgery, prosthetics, and operative dentistry. The complaint is general that orthodontic instruction is not given a place of equal importance with other phases of dentistry in our undergraduate curricula. Yet the licensing of a dentist in nearly all states permits him to practice orthodontics on the trusting public.

Orthodontics, like general dental practice, is confronted today by two conflicting trends. The first is toward a greater intricacy and skill demanded by our growing knowledge of the importance of all dental treatment to general health. That orthodontics is a health service can no longer be doubted. If it concerned itself only with tooth alignment, ideal arch form, facial dimensions and contours, orthodontics would be merely a cosmetic art. However, when it concerns itself, as it now does more and more, with the interrelation existing between dental malposition and endocrine and metabolic disturbances, with masticatory function, and with the prevention in later life of pyorrhea and caries, then the practice of orthodontics is truly a service rendering improved health.

The recognition of these important responsibilities makes the science of orthodontic treatment more complicated. The accomplishment of these health objectives is under no circumstances a simple matter; but to attempt their accomplishment in a haphazard way, by procedures based upon snap judgment and inadequate, vague diagnostic study, is difficult indeed. To institute treatment with no clear conception of the etiologic factors involved in the case and

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to move teeth about with no idea of the position they must occupy for harmonious relations with the other mechanisms of smooth and efficient function would be a time-consuming, difficult, and costly operation.

The second trend results from the unconscious reaction of orthodontists to the national feeling of the moment, to the general economic trend toward the simplification and the reduction in cost of all health services. Simplification may be defined in one way as discovering the easiest and most direct method for achieving desired results. When perfected, such methods often may eliminate the need for repetition, tedious experimentation with new techniques, and careful mapping out of treatment. Another kind of simplification is effected by ignoring health requirements and compromising with ideals. Lowered standards must be fought by orthodontists, for treatment of patients on such a level is no insurance against their ill health in the future. So that simplification will not assume too great importance, it is imperative that the undergraduate who is the future orthodontist be given more extensive training. An over-all view of the possible problems that will face him is an essential part of orthodontic knowledge.

For many years it has been evident that students have regarded orthodontics as one of the most unpopular subjects in the dental course, and have often thought of it as just another subject needed to meet the requirements for a dental degree. Improving the teaching of the subject is the logical first step in the direction of creating enthusiasm for the study and practice of orthodontics, and a desire to make contributions to the field.

A well-rounded training program in orthodontics for undergraduate students should be the obligation of our universities. In a number of dental colleges the teaching staff should be organized and facilities should be available for both undergraduate and graduate training. In all others, an undergraduate course should be given. The successful practice of orthodontics requires more intimate knowledge of principles of biology, of physical forces and physiologic function than any other branch of dental service.

A course in orthodontics should be as long as the regular dental course. One of the most important phases of undergraduate instruction is a thorough knowledge of cranial growth, development, and function, in order that major and minor deviations from the normal may be recognized by every student. They should be taught how to advise patients regarding malocclusion, methods of arresting such cases, and to understand the dangers in orthodontic treatment. The undergraduate course should infuse an appreciation of the value of a normal healthy denture for the child as well as for the adult. A student should learn how to supervise and control the developemnt of a child's denture, and to understand its dentofacial relationship. Scientific methods for the study of facial form should be introduced, so that the student will be able instantly to detect any malformations of features which are caused by anomalies of dentition. Ability to diagnose and to prognose every kind of dental anomaly is essential.

Orthodontic education should be analyzed rationally, paving the way for the elimination of unfair and extremely negligent methods. A new system can and should be inaugurated which is based on the urgent needs of millions of

children. A course of practical value should be planned, and instituted on a working basis. Much has been said concerning the content of a course of this type, but this must be determined, in part, by the conditions existing in the individual schools.

Orthodontics as taught at some schools has gradually changed from a course of study consisting of a few lectures given to the senior dental students by practicing orthodontists, to one comprising a series of lectures in the sophomore, junior, and senior years, two laboratory courses, and clinical assignments under the direction of qualified instructors in the department. Rather than trying to teach only enough orthodontics required to pass the state board examinations, an effort is being made to give the undergraduate the type of training in the field of orthodontics that will have everyday clinical application in the practice of general dentistry, as well as form the backlog of information which possibly may lead to specialization in orthodontics.

There are three objectives in such a course of training. The first of these is to teach the general theory of orthodontics. The second is the acquisition of knowledge of normal growth and development of the dentofacial complex so that the student is able to differentiate between patients exhibiting abnormalities and those passing through developmental stages which appear as dentofacial anomalies. A third objective is to teach enough clinical orthodontics to enable the student to treat the so-called simple cases, even in a general practice.

If inclusion of it were feasible in the undergraduate program, an opportunity should be given the student to observe growth and development of facial form in selected cases over a period of three years. An understanding of such cases would require some introductory lectures in orthodontics early in the undergraduate curriculum. For example, during the first year the course should consist of theory and general concepts rather than practice. The second year should include approximately twenty one-hour lectures presenting to the student material regarding the history of orthodontics, growth and development of the face, cranium, and masticatory apparatus, basic principles of normal occlusion of the primary and permanent dentition, and the classification and etiology of malocclusions. Twenty laboratory sessions, or about fifty hours, should be employed in teaching the technique of impression-taking with all types of materials, the making of orthodontic casts, and freehand soldering. Time spent in learning to construct space maintainers would also be of value. In the third year, students should be given theory, as well as laboratory exercises and the fundamental clinical applications. Basic subject matter to be covered should include diagnosis, prognosis, tissue reactions in orthodontic movement, time to treat, treatment methods and aids, anchorage, retention, and oral surgery in orthodontics. It would be well to outline the possibilities for treatment and to carry out some procedures on several typical cases. The fourth year should be devoted to theory, a review of the material presented in the preceding years, and several lectures on the application of prophylactic orthodontic techniques. Senior students should also be required to construct simple appliances and to attend the orthodontic clinic for observation of treatment methods instituted by the postgraduate students and the instructors.

The primary idea presented in this paper is that orthodontics should constitute an integral part of dentistry, and that it should be placed in the dental curriculum as one of the major fields of study, along with operative dentistry, oral surgery, and dental prosthesis. Two reasons contribute to this viewpoint. First, if present trends are a reliable indication, in the future general practice of dentistry will probably include an increasing amount of orthodontics. Certainly, there is a great need for this service, and the dental profession is likely to heed the urgent demand. Second, orthodontics, perhaps more than any other subject, correlates the various courses of the entire dental curriculum. It helps to establish in the mind of the student a concept of the normal, regarding both form and function, which is the basis of diagnosis and the foundation of dental service. No student who has carefully studied orthodontics would practice the other phases of dentistry in the same way had he not learned its principles. To regard orthodontics as an isolated field of instruction and practice is failure to use it properly in the education of the general practitioner of dentistry.

In the past the teacher of orthodontics has been called upon to augment the general instruction in many of the biological sciences. This should not be necessary if the biological sciences are taught as suggested previously. Much time can be saved for a more detailed study of orthodontics if the teachers of allied courses are advised concerning the application of their subject matter to the problems of orthodontics, thus avoiding any overlapping. These related principles learned in other courses of the curriculum should be constantly referred to and used in the study of orthodontics.

The objective of orthodontic instruction in the undergraduate school is to furnish a rather thorough background in the fundamental principles and in the application of these principles to practice insofar as they are related to the work of a general practitioner of dentistry. The objective recognizes the impracticability of expecting the undergraduate student to deal with all the intricate problems incident to particularly difficult or unusual cases. Instruction should be focused toward giving the student an appreciation of the important place of orthodontics in modern dentistry and creating in him a desire to continue the study in his years of practice. It should also aim at helping the student to understand related points in other branches of dentistry.

When the student has completed his study of orthodontics in the undergraduate school, he should be able to appreciate the effects of normal occlusion and of malocclusion on oral health and on general health; to recognize the important part played by the deciduous denture upon the development of the permanent denture; to realize the value of orthodontic service for children in preserving the health and function of the teeth and facial harmony; to supervise the growth and development of the natural dentures and associate parts; to diagnose cases of malocclusion and to treat cases that do not involve particularly difficult or unusual problems; to recognize the shortcomings of both his knowledge and his ability with respect to orthodontics; to evaluate new equipment and practices in the field on a scientific and rational basis, and to make proper case records for orthodontic service.

We are concerned with the problem of better undergraduate dental education because the undergraduates of today will be the orthodontists of tomorrow, and to them will pass the responsibility for making new contributions to the science. Many practicing orthodontists are, or have been, teachers, and are aware of the fact that the dental profession should be able to look to them for advice and guidance. Orthodontists should make an appeal for changing the dental curriculum so that more training can be given the undergraduate. As his knowledge and familiarity with orthodontics increase, we can hope that so will his desire for work and research in the field.

Advances in orthodontics must be accomplished through graduate training. Such training, helpful not only to the orthodontist but also benefiting the public which he serves, encourages striving for higher standards of excellence and provides incentive which can be directed toward research.

The recent trend in orthodontic education is the tendency to break away from archaic systems. Orthodontists advocating the use of only one appliance are becoming a smaller and smaller minority. The one-appliance curriculum is fast going out of date. Every orthodontist should have a clear conception of the basic principles of tooth movement not only in a physiologic or histologic sense, but also in a mechanical sense. He should be familiar not only with the principles of the application of therapeutic force, but also with all the mechanical means for applying it. The graduating orthodontist should understand the use of the various types of appliances now available. With such a comprehension, he will be able to combine these appliances to accomplish best the movements required by the specific case. Therefore, the modern orthodontic curriculum should teach the basic principles and the manner of employment of all the appliances currently used in orthodontic practice.

Orthodontic education must be carried on in universities where competent instructors who are experts in the related specialities are available. The best orthodontic education and the greatest advancement come when knowledge assembled in the several scientific departments of a university can be pooled, integrated, and applied to orthodontic problems. In the past few years the profession has become aware of the changing trend in graduate and postgraduate teaching, especially as it applies to orthodontics. The need for thorough training has been realized for a long time, and various attempts have been made to set a minimum standard for specialization.

We must remember that the achievement of the highest objectives of orthodontic education requires intelligent criticism of its procedures, and corrections based on the results of diligent inquiry. Improvement in our educational standards can come only if we apply careful scrutiny to those existing at the present time, for there is nothing inherent in educational projects to assure their ultimate perfection.

Progress, as commonly defined, denotes a forward movement or an advance; by many it is accepted as an intrinsic condition of life. Nevertheless, progress does not occur unless man conducts a patient and experimental investigation of his problems. During the last few decades, orthodontics has become a remedial

art of the very greatest value to mankind. Its practitioners must now acquire an extended educational background as well as special scientific and technical training. Some universities are recognized for their high ideals in scholarship incorporated into their program for orthodontic education. They have responded to public demands and have enlarged their programs so that additional courses are now offered at the graduate level.

Graduate courses leading to a master's degree require from thirty-two to sixty-four weeks of study, and on original paper or thesis. Most of these credits may be earned in orthodontics if advanced courses are offered. A more comprehensive undergraduate course would admit to graduate standing students more thoroughly prepared and thus ready to continue in progressive work of real merit. Then research in numerous phases of orthodontics could be undertaken and advanced more rapidly.

Orthodontics is a specialty of dentistry, rather than an independent profession, and its successful practice requires broad training and experience. Postgraduate courses need not be discussed in detail, for it seems hardly necessary to point out that the need for their development is as great as it is at the undergraduate level. Only in graduate courses can the finer skills and techniques of orthodontic practice be delineated.

For the best interest of dentistry as a whole, and orthodontics in particular, it is necessary to unite individual activity into one cooperative effort to achieve the goals desired by the dental profession. The objectives to be kept in mind include the attainment of higher standards of excellence in orthodontic practice, the encouragement of research, and the attraction of more students into the specialty by means of better instruction and increased interest. Only aspirations such as these can initiate true progress and fulfill the promise of benefits for the welfare of humanity.

CHERRY ROAD.

THE REMOVAL OF SECOND PREMOLARS IN ORTHODONTIC TREATMENT

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THE extraction of permanent teeth as an adjunct to orthodontic therapy has now been accepted by the majority of the profession as a necessary procedure in at least some cases. Regrettably, in my opinion, it has been generally thought that extraction means, as a matter of course, the removal of the four first premolars. The very real advantages which may be had from the extraction of second premolars instead, in certain malocclusions, seem to have been overlooked. This paper will try to show the indications for the removal of second premolars, and the desirability, in certain cases, of extracting second premolars in one arch and first premolars in the opposite arch. Thus, in addition to the conventional removal of the four first premolars, three other distinctly different combinations of premolar extractions may be advantageously employed, each case to be treated indicating the specific extractions required, as will be illustrated with clinical material.

In a previous paper[1] it was shown that extraction of permanent teeth in no small percentage of malocclusions is necessary if one is to avoid relapse and other undesirable consequences of indiscriminate expansion. Supporting evidence consisted of measurements from models of treated cases made not only at the beginning of treatment but also many years after retentive devices had been discontinued. In that paper (page 280), it was stated: "While the removal of the four first premolars seems to me a step in the right direction, in that it is a recognition of the essential limitations placed upon orthodontic treatment, at the same time the routine designation of these particular teeth for removal is not justified. Some orthodontists select other than first premolars for extraction when such teeth are carious or contain large or doubtful restorations. Quite properly, such factors should be considered, yet not always should they dominate the decision, for there are other important considerations to be taken into account." Insofar as I have been able to determine since the publication of this statement, the general attitude of orthodontists concerning the extraction of first premolars has not changed, i.e., nearly always these are the teeth chosen for removal in extraction cases. With the accumulation of even more clinical evidence on this subject, I hold still more firmly the opinion expressed in a previous paper[2] which closed with the following paragraph: "I have even advocated this type of treatment in certain other cases where there are no congenitally missing second bicuspid teeth. The type of case in question is one diagnosed as a mild bimaxillary protrusion; one for which you might hesitate to extract the four first bicuspids and close all the spaces, for fear of

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facial distortion, but, at the same time, one in which you feel sure there has been at least some forward drift of the teeth. This mild bimaxillary protrusion, if treated in the orthodox manner (without removal of any teeth), would necessitate the moving of the lower anterior teeth further off the ridge in expanding for tooth room, therefore relapse would, in all probability, shortly follow the discontinuance of mechanical retention.'' This statement, published in 1941, reveals that my views concerning the extraction of second premolars originated from a study of methods devised to deal with congenitally missing second premolars. Since then, in seminars and in clinics before orthodontic groups, I have recommended that in many orthodontic cases second premolars should be removed instead of first premolars. These suggestions have been accepted by a few co-workers, and I have had the pleasure of seeing some excellent results wherein these ideas were a part of the treatment.

My first experience with the deliberate removal of second premolar tooth structure was in 1923, when I extracted the maxillary left second premolar to conform with the congenital absence of the left second premolar in the mandibular arch (Fig. 1). The spaces on the left side (Fig. 2) were then closed orthodontically. Models made in March, 1949, are shown in Fig. 3. While the spaces have remained closed and the occlusion is stable, if the same condition presented today I would remove not only the maxillary left second premolar, but also both second premolars of the right side. Unilateral closure of space requires special precautions if the midline of the dental arches is to be maintained in the midline of the patient's face, and both orthodontist and patient might have been spared some of the tedium of orthodontic treatment had this case been dealt with as a bilateral closure. Furthermore, the removal of the mandibular right third molar might have been avoided through the mesial movement of the first and second molars of that side, which would have occurred if space closure had been accomplished on the right side. At any rate, the maxillary and mandibular third molars of the left side, where space closure was effected, did erupt uneventfully and would be serving as functional teeth today were it not for the fact that the mandibular third molar was lost through dental caries. Not only do I believe that this case might have been treated better as a bilateral closure, but I also believe that I should have learned more from it twenty-five years ago, with respect to the advantages of removal of second premolars in orthodontic cases, than I did.

Fig. 4 shows the initial models of a patient who has a moderate deficiency of arch length. The central incisors of both arches, however, are in good positions with respect to their bony bases, and the main objective of orthodontic treatment is to create space for the correction of the rotations and other problems in arch length. This should be carried out by maintaining the central incisors in their present positions, removing all four second premolars and carrying the teeth, distal to the central incisors, toward the spaces created by the extractions. The occlusion, two years after all retentive appliances were discontinued, is shown in Fig. 5. The facial pattern of the patient was good at the beginning of treatment; therefore improvement in the profile was not an objective (Fig. 6).

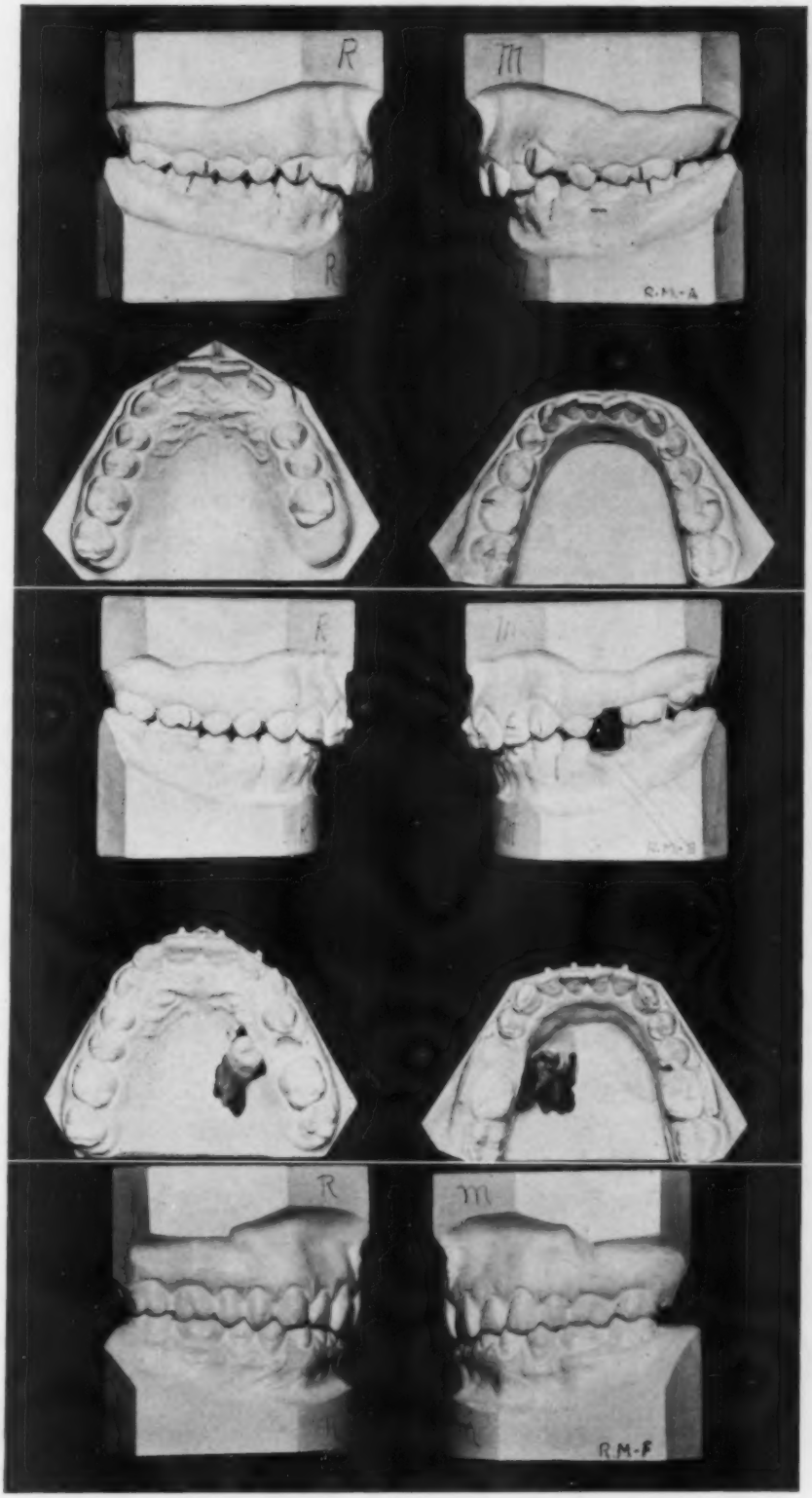


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1.—Case presenting with congenital absence of mandibular left second premolar. Maxillary left second premolar and mandibular left second deciduous molar extracted and spaces closed. (See Figs. 2 and 3.)

Fig. 2.—Same case as shown in Fig. 1, with extracted teeth attached to model by means of wax.

Fig. 3.—Case presented in Figs. 1 and 2, showing the occlusion March, 1940, twenty-five years later.

Fig. 4.

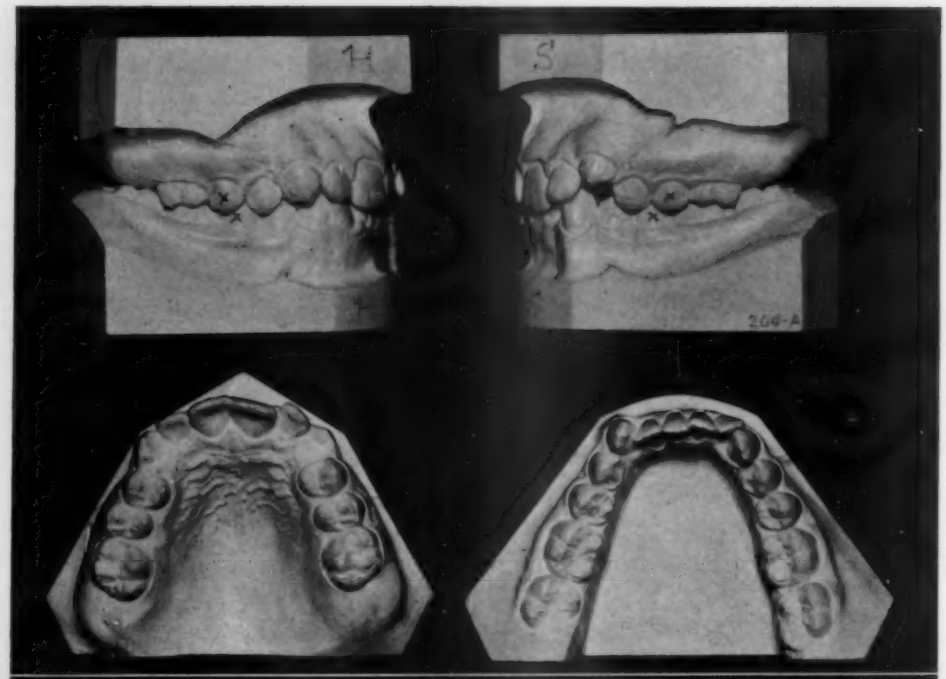


Fig. 5.

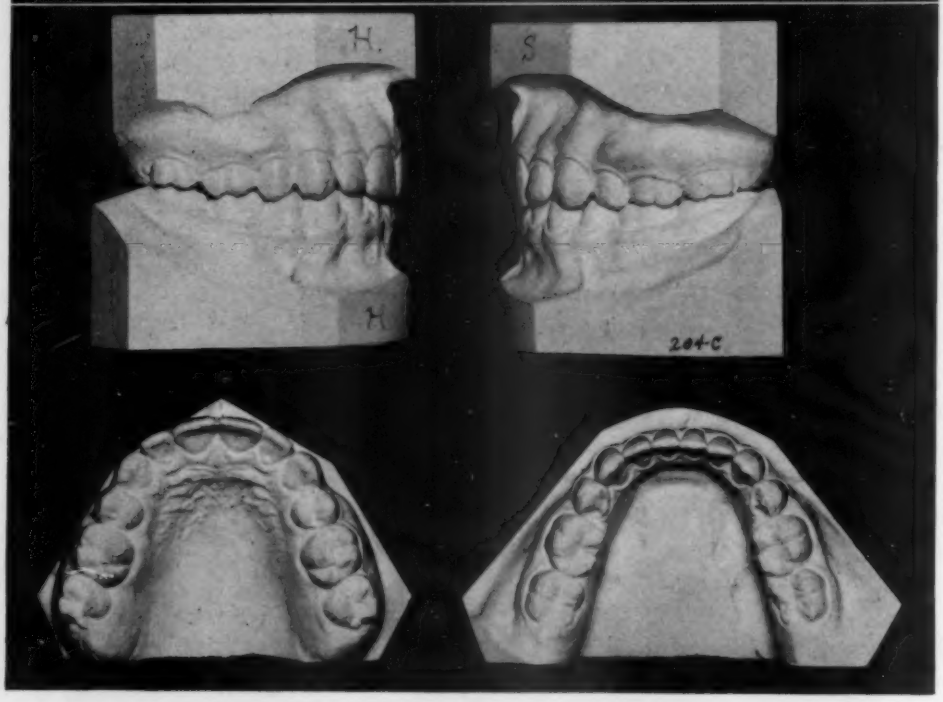


Fig. 4.—A malocclusion wherein the extraction of four second premolars is indicated. (See text and Figs. 5 and 6.)

Fig. 5.—The case shown in Fig. 4, two years after all retention was discontinued.

As previously stated, under certain circumstances the removal of second premolars in one arch may be advantageously combined with the extraction of first premolars in the opposite arch. Fig. 7 shows a case with only slight irregularity of the mandibular anterior teeth, but with some forward displacement of these teeth from their base. Here it is advantageous to remove mandibular second premolars, but the forward position of the maxillary molars and premolars dictates the removal of maxillary *first* premolars. There is insufficient room for the canines and, if second premolars were removed, it would be necessary to move first premolars distally before space would be available for the canines. Fig. 8 shows the occlusion, stable several years after retainers were discontinued. In Fig. 9, photographs taken when treatment was started and also several years after retention was discontinued are shown. The improvement in the facial profile is evident.

Fig. 6.—Profile before treatment and two years after retention was discontinued. (See Figs. 4 and 5.)

Fig. 10 shows the initial models of a patient wherein extraction of the mandibular first premolars and maxillary second premolars was indicated. The crowding in the mandibular anterior segment, in this case, was sufficiently severe that removal of the first premolars in the mandibular arch was considered to be the safest procedure. But the maxillary incisors had a lingual axial inclination. It would, therefore, have been a mistake to tip the maxillary anterior teeth any farther lingually in this case, and the removal of first premolars invites precisely this type of change. Consequently, maxillary second premolars were removed and the spaces closed so that the lingual inclination of the maxillary incisors was not increased. The result of treatment may be seen in Fig. 11, at the time retaining appliances were discarded. Fig. 12 shows facial photographs, before treatment began and when retention was discontinued.

Fig. 7.

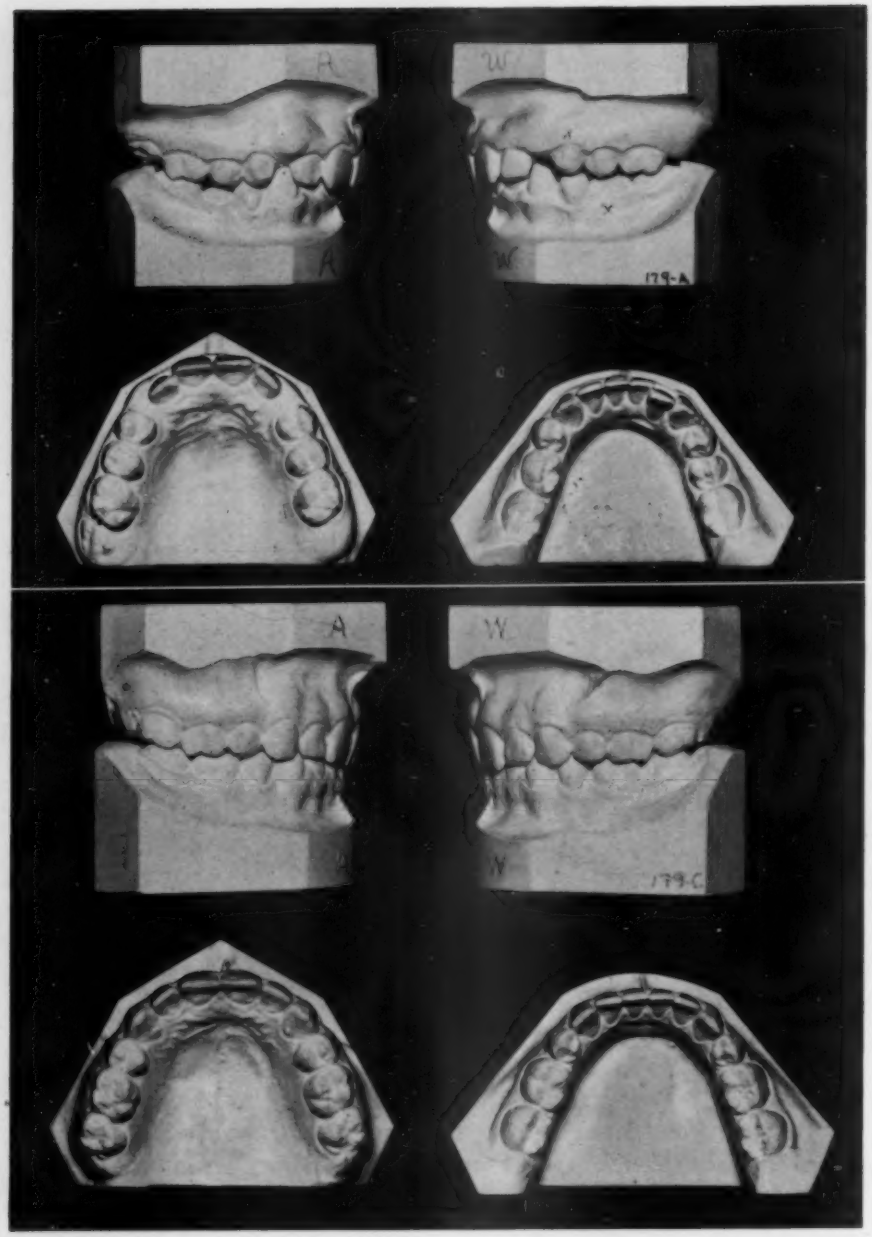


Fig. 8.

Fig. 7.—Original malocclusion, in which maxillary first premolars and mandibular second premolars should be removed.

Fig. 8.—Case in which maxillary first premolars and mandibular second premolars (Fig. 7) were removed, several years out of retention.

Even though the models in Fig. 13 show considerable crowding of the mandibular incisors, mandibular second premolars were removed, in the treatment of this case, instead of first premolars. Fig. 14 demonstrates, however, that the result remained stable after retentive devices had been discontinued for several years. No tooth structure was removed from the maxillary arch. The maxillary right lateral incisor was congenitally absent; after the anomalous form of the right canine had been modified by grinding, it presented an acceptable appearance in contact with the maxillary central incisor. On the maxillary left side sufficient room to relieve the crowding in the lateral-canine area was made by the use of Class II mechanics. I believe the fact is worth emphasizing that in spite of moderately severe crowding in the mandibular anterior segment, it was possible not only to relieve this crowding, but also to utilize the mandibular arch for anchorage purposes in correcting the deficiency of the maxillary left side. Fig. 15 (left) shows the patient at the beginning of treatment. On the right is shown the face several years after retaining appliances had been discontinued. No change in the facial contours of this patient was expected and none was obtained.

Fig. 9.—Facial profile of case shown in Figs. 7 and 8, before treatment and several years after retention was discontinued.

It is frequently pointed out that where the extraction of premolar teeth has been a part of orthodontic therapy, the canines are too often tipped distally toward the spaces, with a corresponding lingual inclination of the incisors. Frequently these unnatural conditions are accompanied by a facial distortion (often called a "dished-in" face) which must be considered as objectionable, esthetically, as are lips which have been rendered too prominent as a result of overexpansion of dental arches. Remaining spaces are also criticized in connection with extraction-treated cases; sometimes these spaces are never closed by the orthodontist, and in other cases spaces will open after treatment has ended in spite of the fact that they were once closed by means

Fig. 10.

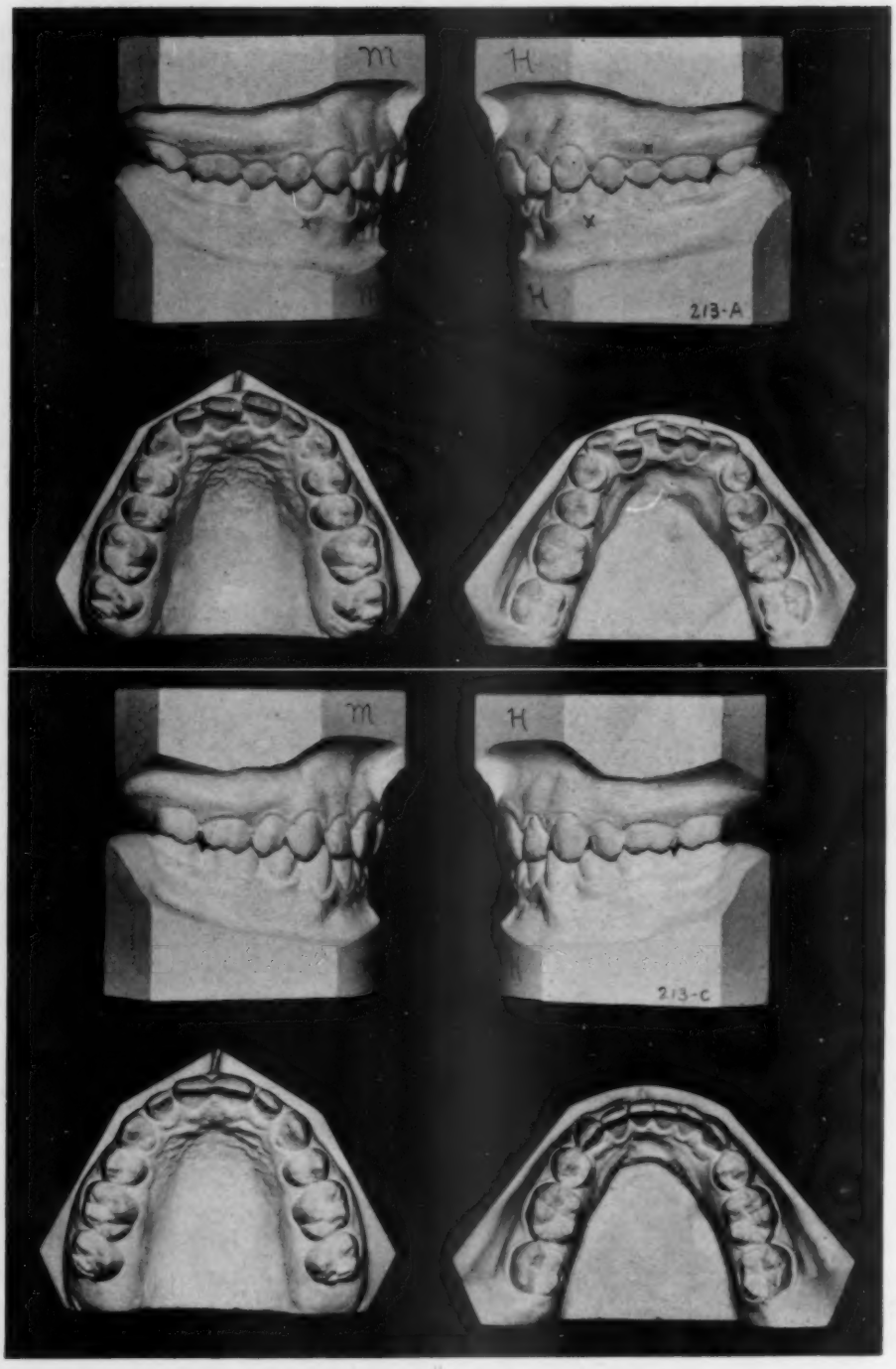


Fig. 11.

Fig. 10.—Extraction of mandibular first premolars and maxillary second premolars is indicated in this malocclusion.

Fig. 11.—Case shown in Fig. 10 as it appeared when retention was discontinued.

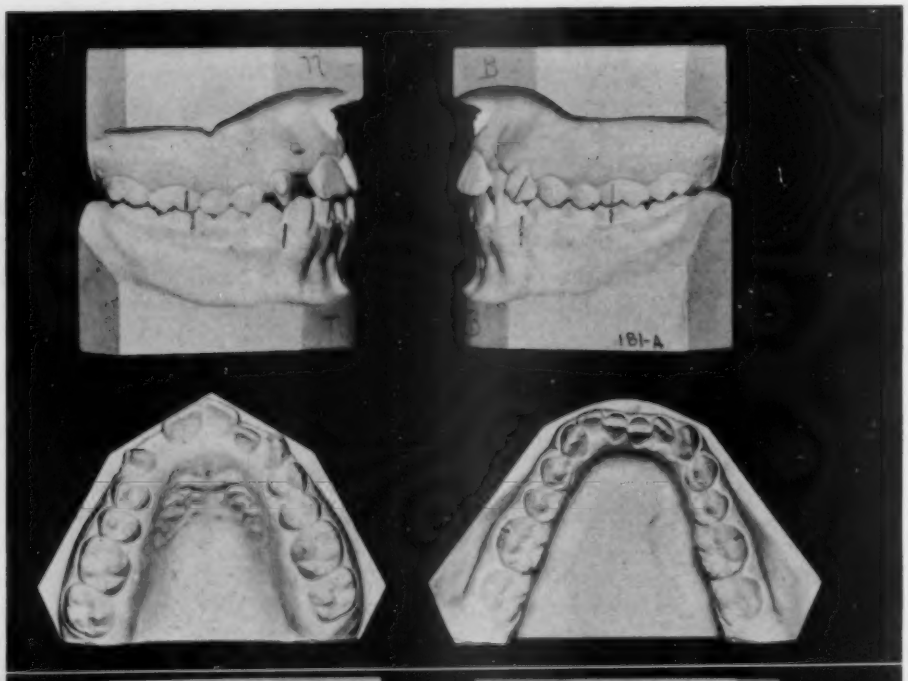
of orthodontic appliances. It is not difficult to understand how these spaces subsequently reappear in cases in which excessive lingual axial inclination of the incisors has been established through treatment. Incisor teeth which have been tipped lingually in this fashion show a strong tendency to return to their former, more upright positions—probably being influenced by action of the tongue. If this uprighting occurs, it is almost inevitable that spaces will reappear in the dental arches. Since these various undesirable results do not occur in cases where second instead of first premolars have been extracted, it is obvious that the criticism should not be directed at extraction, but instead that it be blamed either upon selection of the wrong teeth for extraction or upon a lack of skill in treating the case after the extractions have been performed.

Fig. 12.—Facial photographs of case shown in Figs. 10 and 11, before treatment and at time retainers were discarded.

In the considerable number of years in which I have removed teeth as an aid to orthodontic treatment, I have never encountered a case wherein, later, I wished extractions had not been performed. At the same time, there are several cases in which first premolars were removed where now, were it to be done over again, I would have had second premolars extracted instead of first premolars.

In orthodontics, we seek to place teeth in their proper relationships to basal bone and to the muscular wall which surrounds them in order that these teeth may remain stable. Unless teeth are left in harmony with their surroundings, they will be shifted by environmental forces until that harmony is reached. Therefore, the most important part of treatment planning consists in finding the best methods for placing teeth as near as we can to that state of balance.

Fig. 13.



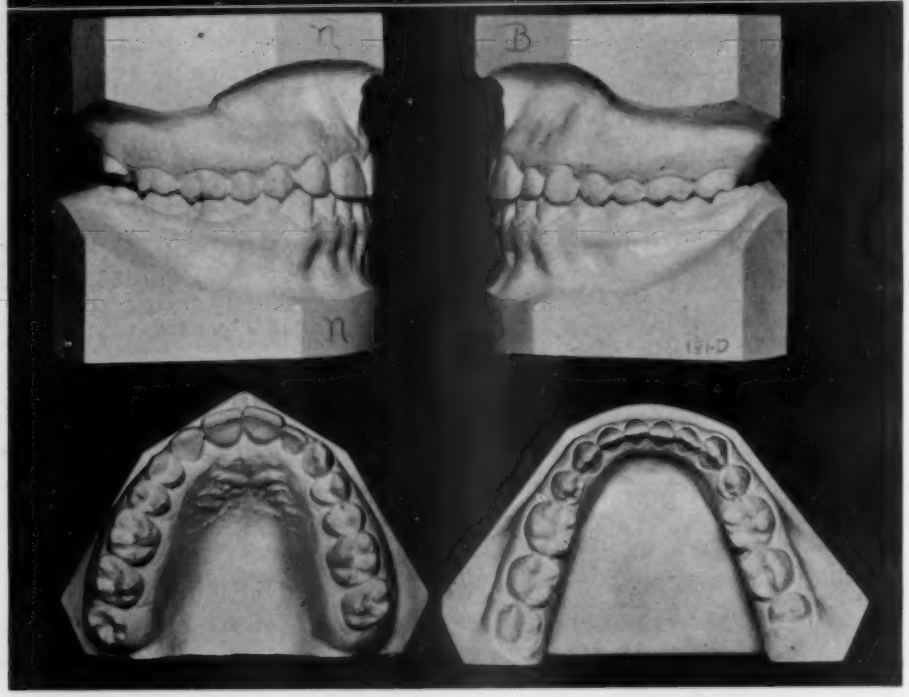


Fig. 14.

Fig. 13.—Mandibular second premolars were removed in the treatment of this malocclusion, in spite of the severity of the crowding of the mandibular incisors.

Fig. 14.—The case shown in Fig. 13, several years after retention was discontinued.

The need is obvious in those cases where the extraction of first premolars is indicated; first premolar extractions *are not* indicated in the sort of case wherein we wish we might extract a part of a tooth rather than a whole one. In this kind of extraction case, after crowding has been relieved, there remains space which must be closed either by excessive lingual tipping of the incisors or by forward movement of the posterior teeth. The undesirable consequences of the former have been mentioned. When it is desirable to move posterior teeth forward, obviously it can be done better by moving molars into the spaces left by the extraction of second premolars, and using first premolars, canines, and incisors as anchorage, than by moving second premolars and molars into first premolar spaces, and relying only upon incisors and canines for anchorage.

Fig. 15.—Facial photographs of case shown in Figs. 13 and 14, at beginning of treatment and several years after retention was discontinued.

There is an abundance of evidence in my practice that in cases in which there has been congenital absence of second premolars, *spaces did not reappear* after having been closed. In other respects also, these cases remained well-balanced and stable. To date, the same may be said concerning my second premolar extraction cases that have been out of retention any appreciable length of time.

The cases shown here and the previous remarks concerning indications for the extraction of second premolars stress only cases with relatively mild deficiencies. Further study of cases in which there is more severe crowding is indicated to establish, with certainty, the suitability of second premolar extractions in this sort of case. In none of the cases shown was occipital anchorage used as a supplementary force; it is reasonable to assume, therefore, that some

of the benefits of second premolar extractions might be extended to more severe cases if occipital anchorage were used during treatment.

The steps involved in treating second premolar extraction cases by means of the edgewise arch were published in 1941,[2] and the technique has not been greatly modified since that time. Consequently there is no need to repeat here the procedures involved, except to emphasize the necessity for maintaining the molars with a distal axial inclination from the outset of treatment, and for leaving them in that position at the conclusion of active treatment. This applies to second molars as much as to first molars and, if second molars were not banded during the major portion of treatment, provision should be made before retention to band these teeth and give them their proper distal inclination before considering active treatment at an end. To leave these teeth with a mesial inclination, which they will assume if space closure has not been accomplished and second molars have not been banded, is to invite undesirable occlusal relationships, and later periodontal trouble between first and second molars. Finally, all spaces in the buccal segments should be firmly closed and then bands distal to the canines (except for the last banded tooth in the arch) should be removed and space-closing procedures instituted to close even these band spaces.

SUMMARY

"Extraction" has come to mean to many orthodontists the removal of the four first premolars; often, where extraction is necessary, the removal of these particular teeth is ill-advised. Cases are shown here, all but one of which have records made several years after retention was discontinued, to illustrate the author's contention that many of the cases in which first premolars were extracted might have been better treated had second premolars been removed instead.

The author wishes to thank Dr. Wendell L. Wylie and Dr. F. W. Schubert, both members of the Division of Orthodontics, College of Dentistry, University of California, for their assistance in the preparation of this paper. Dr. Wylie assisted in the preparation of the manuscript; Dr. Schubert is responsible for the photography.

REFERENCES

1. Nance, Hays N.: The Limitations of Orthodontic Treatment. II, Am. J. Orthodontics and Oral Surg. 33: 253-301, 1947.
2. Nance, Hays N.: Case Reports, Angle Orthodontist 11: 110-122, 1941.

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FACE VALUE

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WE as orthodontists are familiar with the many aims and benefits of our science of orthodontics; but in considering them we should not imagine that they are limited to the mere restoration of the teeth to normal functional relationship for the mastication of food, for the teeth must fulfill other functions as well. In speech, in respiration, and, in fact, in the general plan of growth and development of the face and skull, they are an important factor. The occluding teeth, as we know, are surrounded and supported by tissues and structures whose development is dependent in part upon the stimuli which come from their normal functioning. Loss of function of these teeth is reflected into the surrounding structures as maldevelopments, the extent and severity of which are often in direct proportion to the malocclusion.

In addition to the benefits already mentioned, there is still another objective which is of paramount importance to our patients in the attainment of both health and happiness. This is psychological and deals with the mental aberrations produced in varying degrees as the result of dentofacial deformities.

Displayed at every personal contact with other fellow human beings, the face is the most significant, the most conspicuous part of the body. It is our façade, the front which we present to the world; and from it our fellow human beings form first impressions before having an opportunity to know anything else of us. Writers have said that upon it is implanted the image of our soul. And certainly it is true that it is the face which is practically our most important instrument in portraying our personality to others. Upon it is registered the whole gamut of human emotions!

Dr. James D. McCoy tells us that personality is perhaps the greatest single factor in life, and while it is, strictly speaking, not a physical attribute, yet mental and spiritual attributes are reflected to a great degree in the physical. The face symbolizes the sum total of personality.

In the mad rush of this modern age of keen competition, our patients are accepted at their "face value." Their faces are their introduction and by it they are judged. Before they get a chance to reveal the charm of their personality, the brilliance of their intellect, or the nobility of their character, their face has prejudiced the world either for or against them. The face has been aptly described as the show window of the mind and body.

The prevalence of dental, oral, and facial deformities among civilized races is existent to an appalling degree. It has been estimated that 80 per cent of our children are victims of major or minor defects of occlusion. An observa-

tion of the mouths and faces of those with whom we come in daily contact reveals the terrific destruction of tissue as a result of the loss of teeth and the failure to provide suitable restorations.

Psychiatrists tell us that dentofacial deformities are so highly obvious, so definitely tangible, so disfiguring that they constitute an ever-present source of suffering varying in degree from embarrassment to exceedingly great mental pain. It is commonly agreed that these deformities are the chief etiological factor in many a definite neurosis.

Have we as a profession fully realized the psychological factors involved? Have we understood and appreciated the psychological disturbances and their effects to which our patients have been subjected?

Dr. Karl A. Menninger in his book *The Human Mind* defines "mental health" as the adjustment of human beings to the world and to each other with a maximum of effectiveness and happiness—not just efficiency, or just contentment, or the grace of obeying the rules of the game cheerfully. It is all of these working together. It is the ability to maintain an even temper, an alert intelligence, socially considerate behavior, and a happy disposition.

The first and foremost psychological effect of dentofacial deformity seems to manifest itself in a sense of inferiority, self-consciousness, and shame. Menninger tells us that a sense of inferiority is a phrase so aptly describing a painful emotional experience common to all mankind that when coined by the psychiatrists it was immediately appreciated and pressed into use by the laity as well as the medical profession.

What is it, and why? The sense of inferiority is a complex, painful emotional state characterized by feelings of disadvantageous comparison, of incompetence, inadequacy, and depression. It may be present in different individuals in varying degrees. The degree to which it is present will determine the degree to which certain traits or tendencies frequently associated with it are present, some of which are:

1. Self-consciousness or self-preoccupation; shown by blushing, embarrassment, delusions of reference, a tendency to be unduly concerned with one's feelings, thoughts, plans, motives.
2. Self-criticism and self-dissatisfaction; a tendency to feel that one is not appearing to good advantage, to be critical and worried about what one is doing or has done, to reflect on possible mistakes or blunders.
3. Touchiness and oversensitiveness; a tendency to make exaggerated responses to praise, blame, defeat, and disappointment, to care intensely about what other people think of one.
4. General emotional and nervous instability; unresolved emotional complexities and antagonistic trends, fits of despondency, depression, apathy.
5. Persecutory trends of a more or less definite sort; the feeling that one is unappreciated, unjustly treated, that the world in general fails to appreciate and reward merit, and to recognize wrongdoing.
6. Unwillingness to put one's self to the test because of fear of an unfavorable outcome, which would be intolerable.

7. Lack of ability in certain lines of overt endeavor which demand a fair degree of self-assurance; lack of social poise, inability to carry on enterprises such as selling and executive work.

8. Perfectionist tendencies; an attempt to compensate for felt inferiorities by exaggerated conscientiousness, meticulousness, fastidiousness.

Basically, feelings of inferiority depend upon the individual's painful and disadvantageous comparison of himself with others. Thus the victim of deformity is much more likely to develop a really searing sense of inferiority feeling early in life—the minute he begins making social contacts.

Dr. Claire L. Straith says that children are notoriously observant of the unusual. A great deal of undue attention is invariably directed at any facial abnormality possessed by a playmate. There is no attempt on the part of a child to conceal his curiosity or to refrain from remarking about the defect publicly or from ridiculing the afflicted companion. Whether his intentions are malicious or sympathetic, or simply curious, he will be openly frank in his discussions and opinions. In a less purposeful manner he will shun the deformed associate or will force him into an inferior social position.

Consider this unfortunate child—the organic inferiority cannot remain unknown to him. He knows because he can see himself in the eyes of others; he knows because of the cruel taunts of the little playmates about him—glad to find someone their inferior and someone to torture—they won't let him forget. A note of permanence is often added to these childhood stigmas by "dubbing" the deformed child with a derogatory nickname which refers to his defect.

It is little wonder, then, that the great majority of deformed children quickly develop a feeling of inferiority and a sense of shame. Probably this mental factor develops much earlier than is generally realized. This "inferiority complex" does not become a serious problem until the child enters school. He is then brought to realize his difference from the others and finds that he is not able to acquire the intimate companionships enjoyed by his playmates. As the child matures he becomes increasingly more sensitive. When adolescence is reached a sense of despair and a pessimistic philosophy of life admixed with all sorts of peculiar personality traits have been established.

Lowrey tells us that personality depends on two fundamental drives. The one is for self-expression and the other for conformance with accepted social standards. When these two factors coincide, a pleasing personality develops.

When this is applied to the deformed child, the result is obvious. The deformed child may have every mental and physical faculty for self-expression possessed by other children, but, because of his deformity, he is either restrained by others, or avoids the personal contacts necessary for such expression. Activities are either shunned or altered.

Three reactions may result: first, the child may succumb to these obstacles and accept nonexpression as his lot; second, the child may develop a compensatory overabundance of self-expression to satisfy his injured ego; third, under fortunate circumstances the deformed child may replace the suppressed modes of self-expression with alternative ones of equal merit.

Let us consider the case of a boy named Jim, who never quite reached any of the three reactions just mentioned. Jim was 9 years old when I first saw him. His family dentist realized that something was wrong at school and called me, saying that although I might think it best to keep him under observation for a time, he thought that from the psychological angle it would be best to start at once.

When Jim came into the office the first time, he was so shy that I had a hard time getting him to say a word. I asked his mother about his school work and so forth, but with the usual parental pride she said he did about average. It was a severe protrusion case, in which the lower lip caught under the upper incisors, and it required great effort for him to close his lips at all.

Treatment was started and instructions given for myotherapy to be carried out at home. He was a most cooperative patient, and in a short time the upper anterior teeth were in normal relationship for his age.

At the end of about six months his mother came in and told me she was, to say the least, delighted—that it was the first time in his life he had ever made the "honor roll" (he has been there ever since), and he had even taken part in an oral discussion in class, whereas in the past Jim had always been ill on the oral topic days.

I know he may need further treatment at a later date as he is still in the transition stage, but orthodontics did something for him which changed his personality as much as it did his occlusion. It has given him a good "face value" and any feeling of inferiority has vanished.

There is one type of case in which we can do more for the patient than almost any other. That is the cleft palate child. I will merely mention one history from our cleft palate clinic at the Children's Hospital.

Ronald was operated upon and the palate closed when he was 3 years old. The cleft was in the soft palate, involving one-fourth of the hard palate. The lip was not involved.

The notation placed in his hospital chart in 1941, when he was 4½ years old, is: "Needs speech training badly." About a year later it was decided to enter him in our special speech class for cleft palate patients. The Child Guidance Clinic gave him a psychological examination at this time. Let me quote from the report: "This boy is approximately average for his age (I. Q. 97) as far as mentality is concerned. He is very immature emotionally, however, and is shy, retiring, and babyish. He reacted strongly to failures and would burst into tears easily if he failed to answer a question. The impression is that he will *not* be ready for the first grade in September and that he should stay in kindergarten at least another year."

This was done and the following year he was placed in the first grade, where special speech training was given. When Ronald was 7½ years old, it was decided to start orthodontic treatment and the case was assigned to me. My notation in the chart at that time is: "Class I with a tendency to Class III, upper central incisors locked lingual to lowers and a narrow upper arch."

The upper incisors were brought over the lower and the speech training continued for about a year, at which time the family moved to the country and

Ronald was placed in a small country school. His speech not only improved, but he was able to keep up with his class.

In checking with his teacher a short time ago, I found that he not only enters into all school activities, but that he has also assumed the role of protector for a boy in the school who has a speech difficulty, making the other children accept him in their games.

Orthodontics, coupled with proper help in speech, has completely rehabilitated this boy. It has given him "face value" with his associates, and as far as outward signs are concerned he is normal in all his reactions to others. What is more important, others are normal in their reactions to him.

A second important factor in the development of personality is the acquisition of popularity. There is present in everyone the very strong desire for the affection, liking, and good opinion of his fellow men—the need to be accepted as one of the group. Before a handicapped child can gain group recognition, he must first overcome the tendency of other children to maintain the natural impression of abnormality and undesirability. Many unfortunates are inclined to give in to these difficulties and to make no effort to become one of the group. Others become resentful toward their obstacles and mistreatment. Blame for their failures is either inwardly or openly placed on all manner of circumstances and people. From the sociologic point of view, this is the dangerous group. These are the children who may develop distinctly objectionable social behavior, since they often will not or cannot maintain friendships, cannot obtain desirable employment, and may not succeed in matrimonial ventures. As a result, they may resort to criminal activities. Evans has given an excellent fictitious description of a boy who was taunted and ridiculed with the nickname "Barracuda" because of his ugly protruding teeth. This boy's retaliation was to make good his nickname, becoming a relentless criminal. Straith suggests: "Thus do the cruelties of youth create rogues."

To illustrate, I will tell you about a boy we will call Dick, who first came to the orthodontic department of the hospital when he was 14 years old. He had come to the outpatient department because he had been sent home from school with a note to his mother saying he had "sores" which turned out to be caused by body lice. His mother brought him in and told everyone within hearing distance what a care he was to a widow—she and the father were separated—and how she had done everything for him, even to having him circumcised.

His social worker got him cleaned up, talked to him, and found that to him the greatest problem was the fact that his teeth protruded and in school he was called "shovel-teeth" by the other fellows.

The protrusion was not very great, but the lip tone was very poor and the mouth hygiene can only be described as terrible. However, we had his teeth cleaned and cavities charted, gave him a toothbrush, and decided to see what could be done about his teeth.

About this time he came down with a severe cold and it was thought best to build him up by sending him to camp for the summer. The social worker

provided some new clothes to help build up his ego, and we delayed starting orthodontic treatment until fall.

Dick came back from camp in fine spirits. We arranged a series of appointments in the dental clinic for fillings to be completed. However, he was no sooner back at school than we received reports about his "skipping." When asked why he did not go to school, it was the same answer as before, "The boys tease me about my teeth." To make a long story short—because of lack of funds, cavities not filled, and other delays in starting treatment, it was November and I had word that he was being sent to reform school because of his delinquency at school and the fact that his mother could do nothing with him.

If we had started treatment when he first came in, could we have helped him enough to save him from the stigma of reform school? Was this delinquency nothing more than compensation for failure to enjoy normal expansion of the personality, in part due to the feeling of inferiority caused by his teeth? I do not know, perhaps reform school is the best place for him, but I do know I wish we had tried a little harder to help Dick feel that we were doing something for his "shovel-teeth."

Patients with severe malocclusions frequently experience a very definite psychological trauma—upheavals and stresses of pronounced magnitude. In a woman, this may represent a personal tragedy, a definite, real, and unalterable lack of something which cannot be disguised by cosmetics, beauty treatments, or costly clothes.

In both men and women, not only pride is affected, but also their confidence, courage, sense of well-being, and their happiness. They know what an important economic and social factor the face is.

There comes to mind the case of Sally, a girl about 24, through school, family well off, but she was sullen, unhappy, did not like to go out to parties, and was particularly unhappy about her cross-bite in the anterior section of her mouth. This was corrected and the other day, one year after treatment, she came in to show me her engagement ring and thank me for what I had done for her in the way of changing her outlook on life. I was amazed at the change. She is now a vivacious girl who can only be described as "bubbling over."

There is no need to cite further case histories. We all have them in our practices, but there are times when I wonder if we do not become so immersed in the treatment of the teeth and jaws that we fail to realize that in treating them we are treating the whole organism—both body and mind.

Good, bad, or indifferent, the face remains that part of ourselves by which we are most really identified, and as often as not brought up for instant judgment.

There is so much to be done; there is so much that can be done. Let us strive to have greater vision, to keep constantly in mind what adequate orthodontic service means to the child—to the adult he will become. Let us keep ever before us the immeasurable extent to which we can add to the health, beauty, and opportunity, the "face value" of our patients—to their happiness and general effectiveness as human beings.

REFERENCES

1. Brophy, John: The Human Face, New York, 1946, Prentice-Hall, Inc.
2. Dunbar, Flanders: Mind and Body: Psychosomatic Medicine, New York, 1947, Random House.
3. McCoy, James David: Applied Orthodontics, Philadelphia, 1946, Lea & Febiger.
4. Menninger, Karl A.: The Human Mind, New York, 1948, Alfred A. Knopf, Inc.
5. Morgan, John J. B.: The Psychology of the Unadjusted School Child, New York, 1936, The Macmillan Company.
6. Newton, Roy: How to Improve Your Personality, New York, 1942, McGraw-Hill Book Company, Inc.
7. Sadler, William S.: Modern Psychiatry, St. Louis, 1945, The C. V. Mosby Company.
8. Salzmann, J. A.: Principles of Orthodontics, Philadelphia, 1943, J. B. Lippincott Company.

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provided some new clothes to help build up his ego, and we delayed starting orthodontic treatment until fall.

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NEW APPROACH TO PULPAL DISTRESS

M. B. Gillman, D.D.S., LL.B., Queens Village, N. Y.

MUCH of the dicta contained herein was gathered from the published work of many of the stalwarts among our dental researchers. Biographical mention is made of them and their valuable contributions.

When we note the swelling that usually accompanies hyperemia and inflammation, we can readily see the destructive effect this process could have on a pulp encased in osteoid tissue, histologically incapable of providing the necessary space so essential to accommodate the additional exudative factors that go with inflammation.

Equally bereft of space is the condition wherein a pus pocket forms on the periphery of the pulp under a metallic filling, or a pulp cap, only to result in strangulation and necrosis for want of more room for physiologic relief. The more blood that pours into the pulp to combat the invader, the greater will be the phenomenon of exudation and migration of cellular elements and consequently, the less will be the living space for the pulp and its component parts, a condition repugnant to and inconsistent with biologic principles. Apparently the pulp is damaged by its own attempts at recovery.[6]

Often fistulas opening into the mucosa will afford a measure of relief. Nature does circuitously what man is loath to do directly. The fact that speedy relief is obtained in congestions by removing the pulp cap and puncturing the pulpal wall is conclusive evidence of the efficacy and wisdom of such a move. Strangely enough, only in these extreme cases does the dental practitioner feel justified in employing the age-old therapy, "open and drain." This reluctance is regrettable.

For years the medical men were similarly apathetic toward opening into the "brain-cage." Fortunately for the living such disinclination retreated before an impetus of progression. One surgeon opened the cage to relieve pressure, and strangely enough the patient survived. Once the track was hewn, others followed. Today openings into the cranium are commonplace. The orthopedic surgeon opens through the hard and unyielding capsule of long bones to relieve the pressure and infection within the bone marrow, and many potential osteos are aborted. It was not so long ago when a deliberate surgical opening through the pericardium was taboo in the higher echelon of surgical caste. Today it is just one of those things.

These analogies unequivocally indicate to the general surgeon that there are no sacred portals of entry, no sanctum sanctora. To the dental surgeon, however, there is but one—the dental pulp, and for good and valid reasons.

The pulp, a delicate organ, is richly endowed with much vascularity and an abundance of sensory nerve endings. Apparently protected by two calcific

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coverings, it sees fit to pervade the farthest recesses of the dentine via long "S"-shaped, protoplasmic-filled tubules, the dentinal fibrils, anastomosing freely.[5, 6, 7, 9, 12, 13, 14] These are sensitive to an inordinate degree. Their acute sensorium stems in part from their multiplicity, and in part from the fact that each tubule carries a terminal nerve ending.[5, 12, 13] Particularly crucial is the conduit action by and between the pulp, and the developmental defects in the enamel and dentine matrix, not to mention histologic structures of doubtful mission, like tufts, spindles, lamellae, interglobular spaces, weakened and badly calcified prism sheaths, and poorly calcified intercemental substances.[5, 7, 12, 13, 14] The function of these channels of destruction appears only to aid and abet in the early demise of the pulp. Bernier and Ash[6] mention brownish bands running from the dentinoenamel junction through the enamel surface as representing divisions between successive layers of enamel deposition (incremental lines of Retzius). Any interruption in the orderly production of this tissue results in structural defects, thereby furnishing invaders with additional avenues of ingress.

In reporting on the continuity of contact of these invasion passages these investigators continue:

> The enamel spindles, processes which extend from the dentinoenamel junction to the substance of the enamel, are most often seen in the region of the cusps. It has been suggested that they are either extensions of the Tomes' fibres from the dentinal tubule, or that they represent odontoblasts which extended into the enamel epithelium before any calcified tissue was formed. Their presence in these areas may result in increased sensitivity. They extend about one-third the distance into the enamel. These ribbon-like structures extend irregularly thruout. They run in the direction of the long axis of the tooth.

Gottlieb[5] reports there are "three regrettable organic structures in the enamel that can be used for invasion and spreading of the carious process . . . lamellae, the prism sheaths and the tufts. In addition there are other methods like the circulating tissue fluids in the tubule."

Against such diabolic and multiple means of assault the pulp has little to offer.

Reporting on intercementing substance, C. Tomes[15] quotes Bodecker (not identified):

> It is not of uniform thickness but is beaded, and Bodecker attributes to it a role of far greater importance, than that of a mere cementing substance, for he regards it as being an organic protoplasmic network which renders the enamel more alive than it has heretofore been considered to be. He believes it to be continuous with the soft contents of the dentinal tubules thru the medium of large masses of protoplasmic matter found at the margin of the enamel and dentine.

There is much evidence to show the presence in enamel of canals communicating with dentinal fibers,[15] also intercommunication of dentine and cementum. Von Beust[17] injected canals with a strong solution of fuschin, and also proved the point by dipping the root apex in this solution. The capillary attraction carried the strain through the dentine.[1]

So much for the nebulous shelter accorded the pulp by its outer covering, the "hard, 95% calcified structure called the enamel." It would appear that

its protective ministrations are more fancied than real, that once invaded its manifold communications with the central organ set up severe areas of pathology.

Immediately enveloping is the dentine, hard, unyielding, resembling bone, and calcified about 35 per cent. Bailey[9] reports that dentine is harder than bone. (This author failed to characterize which bone he referred to.) Through it runs a complex giant network of closely knit wires, the tubules, connecting the pulp either directly or indirectly with every portion of the two superstructures.[6, 12, 13, 14, 15] These fibrils carry the sensory stimuli and the fluid tissue of the works.

The crux of the weakness of the pulp, besides its confinement within bony walls, resides in its histologic and anatomic topography. The grand inconsistencies of Mother Nature were never better exemplified than by the weird and catastrophic arrangement of the elements that make up the dental pulp. From a practical point of view there are four layers:

The outer, the odontoblasts: These are the roots of the protoplasmic projections. Secondary dentine can be deposited without them.[5, 7, 13, 14] Neither does the vitality of the tooth depend on them.[12] It has been demonstrated that the entire middle section of the pulp can be necrotized with vitality still remaining in them (Fig. 1, *d, e*).

The second layer is a transparent zone, "layer of Weil," wherein are found large plexuses of nerve fibers.[6] Beneath this is a closely packed layer of connective tissue cells. Any intercellular activity, migration, and fibration, and these cells are pressed up against the nerve layer with attending pain (Fig. 2, *b*-b). To restrict further the movement of these cells, there is a marked absence of areolar tissue in pulpal health. Only in disease does areolation take place. It is significant that areolation is found only in chronic hyperemia and chronic inflammation, since areolar tissue is softer and displaceable, and can accommodate better the exudative elements of inflammation. To complicate the histologic picture further, the blood vessels underneath the cell layer have remarkably thin walls, and the veins are larger than the arteries. This indicates a particular vulnerability toward a negative damming, thrombophlebitis, and varicosities. Blocking of an already narrow apical foramen further complicates the picture.

Because of its intense sensitivity, the pulp becomes a sort of sounding board for all stimuli however slight. Even the apparently insignificant jarring action of normal occlusion stimulates the dentinal fibers to deposit new formations, resulting in denser dentine. It is important to note that these teeth are more resistant to caries.[5]

Unfortunately, there are few stimulations in direct ratio to the abuse, comparable to the low intensity of a masticatory one; consequently, as a result of these masticatory stimulations, greater deposits of dentine may and do form in and around the chamber, thereby further restricting its breathing space.

It is reported that the mere cutting in or across the enamel or dentine is sufficient to irritate with varying measures of pulpal pathologic response. This response may be in the form of degenerative changes, calcific deposits, atrophy of fatty deposits, or hyperemia, and/or inflammation, either singly or together. The dental pulp is more liable to destruction from hyperemia and inflammation

than any other tissue or organ in the body. In view of its entombment, its unusual topography, and its anastomosing tubules, it is not difficult to agree with this premise. Unless the pulp is given more room "for physiologic breathing space," it will run the gamut of inflammatory process, hyperemia, inflammation, strangulation, and necrosis.

Fig. 1.—Progressive suppuration of the pulp. *a*, Healthy tissue; *b*, odontoblastic layer; *c*, inflamed tissue showing dilated veins; *d*, line of demarcation of suppurative process; *e*, pus. (After Black.) (×100.)

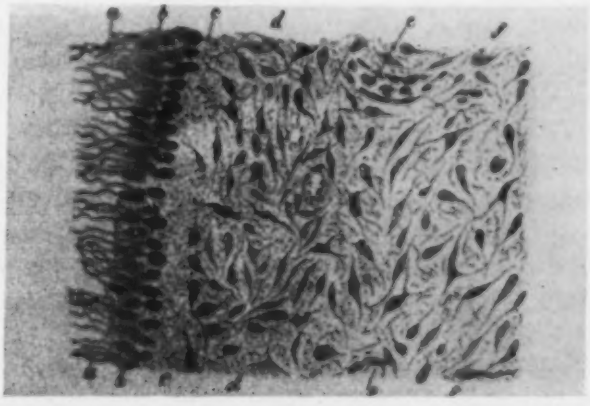

Fig. 2.—Margin of dental pulp. *a,a*, Dentinal fibrils, pulled out of the dentine; *b,b*, membrana eboris or layer of odontoblasts; *c,c*, transparent zone between the odontoblasts and the cells of the pulp proper; *d,d*, layer of cells closely packed together; *e,e*, blood vessels; *f,f*, cells less closely placed toward the central portion of the pulp. (Wales' Immersion 1/12 in. objective.) (After Black.)

Besides caries, there are other irritants that play mighty havoc with the pulp, i.e.:

Thermal changes: The pulp reacts violently to thermal changes. The normal pulp will take a temperature range from 20-30° C. without pain; 20-24° C. causes pain in hyperemia; 20-26° C. causes pain in pulpitis; 43° C. and up, pain in gangrene.[10] The anterior teeth bear the brunt of thermal changes more than the posterior.

Chemical changes: The acids, the protoplasmic poisons, the powerful antiseptics and germicides; drugs capable of destroying germs can also destroy the pulp.

Mechanical changes: Clasps, orthodontic movement, unequilibrated occlusion, hemorrhagic diathesis, like gout, tuberculosis, blood dyscrasias, anemia, simple and pernicious, hemophilia, polycythemia, and leucemia, and inflammation from the gingival trough at the neck of the tooth. Appleton[1] quotes Noyes and Dewey as reporting, "the lymphatics of the gingival surface of the gingival trough penetrate into the periodontal ligament, extending toward the root apex."

Bacterial changes: Turner and Drew by direct microscopic examination (no cultures) found in the living pulp various types of diphtheroids, streptococci, spirochetes, and staphylococci. The mixed infections were always associated with dental caries.

Appleton points out that even those pulps without overlying caries have been found to contain streptococci and staphylococci. Goodby and Barrett[1] report the isolation of the following microorganisms from cavities, both shallow and deep: micrococci, streptococci staphylococci, streptobacilli, and yeast. In hard but discolored dentine at the base of the cavity, the following were encountered: micrococci, B. Strep, *Streptococcus conglomeratus,* necrodentalis, Mesentricus, streptobacilli, and yeast.

Besides infection through the dentinal tubules and periodontal membrane lymphatics, bacteria may reach the pulp from some more or less distant portal by way of the blood stream, a hematogenous infection[1, 16] like typhoid and influenza. Sieberth (via Appleton)[1] reports that pulpitis is due to a streptococcus invasion. "The Streptococci because of their invasive power would seem to be the bacteria best suited for inducing the initial inflammation in the pulp."

Hyperemia may be transient and persistent, get through in the former stage, the latter may be too late. Pain is due to the hyperemia, not the inflammation. The distention of the thin-walled veins, so prone to rupture, may be permanently injured. If "open and drain" is not done promptly, inflammation moves in with severe results. Grasping for the differential between acute and chronic pulpitis is a woeful waste as a prelude for treatment. The differential is more vocal than actual. Actually the symptoms of one interlock the other. If the pain is not relieved by removing the obstacle cover of dentine that precludes expansion under increased blood and transudation, irreparable injury will be done to the walls of the blood. The vast increase of blood supply and the greatly increased force of systolic pressure in the diseased area cause the throbbing pain, recognized as the early stage of an active inflammatory process.

The lumina of the vessels in inflamed areas are increased much beyond their normal size so that the combined areas of the lumina of the vessels within the inflamed area are several times the lumina of the vessels entering the part; consequently, the systolic pressure is greater in the part as the area of the vessels in the part is greater than the area of the vessels entering it. This is a well-known principle of mechanics.

Let us assume the area of the lumina of the entering vessels to be one square foot, and the area of the lumina of the contained vessels to be twenty feet. The pressure of each square foot of the enlarged area is the same as that of the small area. Therefore, it will be twenty times the smaller pressure. This is the mechanics of throbbing—compression on nerve fibers plus throbbing, and the pulp literally "beats its brains out" against the hard dentinal walls.

The throbbing pain is now changed to a dull ache. This is due to the fact that at this time the vessel walls are dilated to their fullest extent and will not "take" any more blood, and, instead of the intermittent systolic pressure that is found in early stages, there is present a pressure that is constant and unvarying. If the extravasated blood has blocked the return at the apical end, the pain may subside entirely with the strangulation and necrosis to follow, or the inflammation may subside with the vessel wall permanently injured.

In circulatory disturbances of the pulp caused by caries or other stimuli, the pain, as mentioned previously, is due to the disproportionate amount of blood in the part, with resultant congestion and pressure on the terminal nerve fibers situated immediately above the congestion. This congestion is either active or passive. The active was reviewed under inflammation. Passive is fully as treacherous.

By passive congestion is meant an excess of blood in a part due to backward pressure. This pressure can never become excessive, so that the most to be expected is a dull ache. The pain may be referred as neuralgia. In static congestion a part of the pain undoubtedly is due to toxic products which accumulate when the exit (apical opening) is affected. It is my opinion (rebuttable) that the host is sensitized by the proteins of the toxic products, thus giving rise to symptoms elsewhere of an allergic character. A lot of work will have to be done on this phase of the problem. Likewise, a diminution of the blood supply to a part (ischemia) causes pain by starvation of the tissues, and as the nervous tissues are by far the most sensitive (the pulp heads the list), disturbances in these vessels produce sudden and sharp pain.

From purely an academic viewpoint, these ischemic pains are experienced after a substernal spasm which drains the neck tissues and the floor of the mouth of blood for a brief moment. (Somehow the maxillary pulps do not seem affected.) The pain is dull and heavy. I have searched the literature without success for some reports on the rupturing of capillaries in the pulp due to purpura haemorrhagica. Perhaps the characteristic discoloration of some teeth without any previous history of caries, or slight caries, or trauma, is due to this condition. (The capillaries, because of their narrow lumina, are first to thrombose, and degenerate.)

Fundamentally my approach is to relieve the congestion, either by depletion and/or creation of additional room for the physiologic expansion of the pulp.

The additional space will give the large veins the opportunity to swell without restriction and without constricting their passage through the foramen. By this additional room, the possibility of thrombosis of the smaller vessels is diminished and compression on nerve endings avoided. Even if the pain subsides and the patient is comfortable, the pulp under this great and excessive irritation will deposit huge formations of dentine in the pulp, thereby causing atrophic changes, or internal absorption. Here lies the root of many neuralgias and headaches of obscure and baffling origin.

TREATMENT

In applying various therapeutic measures, it is mandatory to limit the strength of applications and to observe unusual care and vigilance in guarding against contamination. Consequently, all procedures herein advocated must be done under rubber dam with the exposed portion of the tooth carefully and assiduously flooded with mild antiseptics.

For the sake of completeness, it is repeated that systemic manifestations must not be disregarded in the treatment of pulpal disorders. Thus, syphilis, tuberculosis, anemia, and other dyscrasias may give rise to unwelcome obstacles in an otherwise favorable prognosis. Rest for the sick member is just as important as rest for an injured leg, eye, or arm.

CLEANSING AND ANTISEPTIC SOLUTIONS

Solutions of this sort are employed for flushing the chamber to remove debris at the first opening, and for removing secretions at subsequent visits. They must be *bland, nonirritating,* and used *lukewarm.* They are allowed to run into the chamber either in drops (instillation) or from an abscess syringe. If the latter (irrigation) is used, it is imperative to use a dripping action rather than a plunging one:

1. Boric acid in 2 per cent solution (a saturated solution is about 4 per cent).
2. Sodium chloride in physiologic strength (normal saline, 0.7 per cent).
3. Mercuric chloride from 1:10,000 to 1:6,000.

Boric acid (boracic acid) is used more frequently than any of these remedies. Though chemically an acid, its solution is bland and soothing.

Alkaline wash (important adjunct to the armamentarium).

Rx

Sodium bicarbonate	1.00 (gr. xv)
Sodium biborate	1.00 (gr. xv)
Sodium chloride	1.00 (gr. xv)
Glycerin	4.00 (ʒ i)
Quae Filtart	250.00 (ʒ viii)

STIMULATING AND ASTRINGENT REMEDIES

Zinc sulfate is used often in chronic forms of pulpitis.

Rx

Zinc sulfate	0.03 (gr. ss.)
Boric acid	0.15 (gr. iiss.)
Distilled water	15.0 (ʒ ss.)

M. S. used in instillation, applied with dropper, a few drops at each sitting.

Tannic acid dissolved in glycerin solutions of 5-25 per cent used in instillation.

Silver nitrate: When used stronger than 1 per cent, it acts as a caustic. Should be dissolved in distilled water in strengths of 0.006 to 0.012 to 30.00 (gr. 1/10 to gr. 1/5 to 3 i).

Solutions of silver nitrate spoil upon contact with organic matter; hence no cotton applicators should be dipped into the vessel. A dropper should be used.

DISINFECTANTS AND CAUTERANTS

True disinfectants capable of destroying organisms cannot be used in the opened chamber for fear of injuring the pulp; neither can they be used on the circumscribed area. The inherent status of the pulpal organ as one easily injured must be borne in mind in the restricted use of nonirritating drugs. Succumbing to treatment can certainly be true of this organ; hence, some of the remedies classified under this head, though strictly speaking not true disinfectants in the strength used, have an inhibitory action on the growth of microorganisms and thus act as practical disinfectants.

Metaphen, an organic mercuric derivative, comes from the manufacturer in solution 1:500, is diluted with distilled water 1:2,500, and is then suitable for irrigations in inflammation of the pulp. (Unlike caries in which there is no histologic separation,[5] necrosis of the pulp carries this separation. If neglected it will spread to the entire contents of the chamber and canal or canals.) (Fig. 1, *d.*)

Mercuric chloride is used 1:5,000. When stronger the pulp may be injured.

Silver nitrate in ½ to 1 per cent, none stronger, preferably weaker.

Dionin, a derivative of morphine, an analgesic, is used in pulpitis to aid absorption of capillary exudate. Though not a local anesthetic, it relieves deep-seated pain, acting as a vasodilator and lymphagogue. It still is a moot question whether the pulp has or has not any semblence of a lymphatic system. The literature seems divided. It is suggested that this drug be used under an anesthetic (a few drops of chloroform will do). I use it only during the initial opening, and at this time the area in question is anesthetized. Protective measures like clearing the occlusion must not be overlooked. The tooth in question is a sick member and must be treated like one. The patient is told to favor that side for some two to four weeks.

GENERAL CONSIDERATIONS OF MODUS OPERANDI

The rules of asepsis and antisepsis which govern general surgery are indicated in all openings of the pulp chamber except that strong solutions of germicides are not tolerated by the pulp. In all respects the preparations are similar. Burs are kept in cold sterilization.

The prognosis of the following systemic diseases is considered poor: anemia, pernicious and simple, hemophilia, leucemia, purpura, nephritis, paresis, epilepsy hysteria, neurasthenia, erysipelas, tuberculosis, migraine, lactation.

The tooth is anesthetized, isolated, chamber sterilized. (It is not sterilized with iodine because of iodine's cauterizing qualities. Iodine is a powerful germicide and local irritant. It might be of interest to note that 7 per cent tincture of iodine has been successfully used in cauterizing corneal ulcers [any standard ocular journal]; therefore, I use isopropyl alcohol.) The local action is mildly irritating, feebly anesthetic, and distinctly germicidal. The most favorable concentration for the local action is 60 to 70 per cent—either higher or lower concentration is less effective (United States Dispensatory).

The chamber is washed with the alkaline solution mentioned previously. The walls are cut parallel with the dentinal tubules with no invaded tubule either from the enamel or the dentine left remaining. If the pulp is exposed, the opening is enlarged contiguous with the chamber all around its base. If not exposed, then open in the same manner. Cut the sides of the cavity leaving a protrusion to act as lock for the cement. This prevents the cement from being forced toward the pulp (Figs. 3 and 4). Try not to run the bur into the pulp—the less damage, the better.

If there is an oozing of bright red blood, then stasis has not set in and can be prevented. Irrigate again, and use one of the astringents mentioned, preferably tannic acid and glycerin via instillation. A wetting agent or varnish is applied against the cavity walls, and a soft ball of cotton, not compressed, is placed not too near the pulp, and is superimposed by a layer of pink baseplate, gutta-percha, with the edges sealed against the walls, followed by an oxychloride zinc cement. (The oxychloride is hydroscopic and combines with albumin, the oxyphosphate releases phosphoric acid, so between the two evils, I choose the less.) As zinc oxide contains traces of arsenic, I use it sparingly and away from the pulp.[8]

Should a dark red spot appear upon opening the pulp, then stasis is present, and the technique varies only with respect to the use of Dionin (2 or 3 drops, as mentioned). Marshall[7] reports that stasis is caused by general infarction and thrombosis. Unless the pulp is opened contiguously with the surrounding walls for physiologic expansion to a point where pressure is relieved at the apical ending, then strangulation and necrosis en masse will set in. Black[12] reports infarction and death are induced by intense hyperemia, hence the importance of an early "opening." Exposures complicate the efforts of the operator. During systole the engorged pulp presses against the sharp and irregular edges of the cavity, thus intensifying its suffering and leading to its eventual loss. This explains the necessity for opening, as outlined previously, to avoid sharp edges.

Bacteriologically, a pulp smear may resolve all doubt, as the exudate determines the type of inflammation (cellular debris, white and red blood cells and their products, and bacteria, if any). Cahn[4] reports that if the exudate is bloody and a great many red blood cells are found, it is a hemorrhagic exudate; if the leucocytes are found in majority, it is a purulent one. I have not used the microscope in this work, but its possibilities are great and may well be the answer to many perplexing questions. This field might well take fillings out of the mechanical stage and place them where they belong in the status of dental medicine.

The treated tooth is taken out of occlusion and physiologic rest is ordered for four to six weeks. On the next visit within three days the technique is repeated under a dam. In most cases three visits are necessary before final filling. (An exudative secretion does not indicate a poor prognosis.) The final filling from the pulp upward consists of a thin layer of tricalcium phosphate and eugenol flowed into the cavity without pressure, followed by a thicker mix, a wait of two days, a layer of gutta-percha, then the final permanent filling.

Fig. 3.

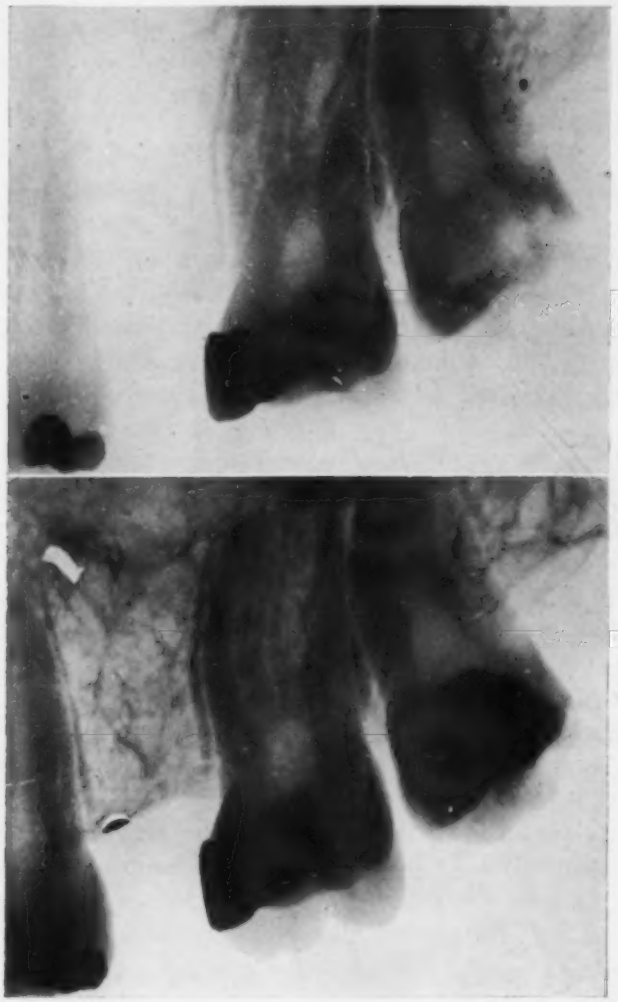

Fig. 4.

Figs. 3 and 4.—Before and after filling.

In the last few years the operator has lost much of his antipathy toward pulp capping, thanks to the far-reaching work of Zander, Orban, Law, Brauer,[29] and Kaletsky[25] for their pulp testing reports. No longer is the pulp an "untouchable"; neither is its sanctity inviolable. This is a far cry from the hit and miss

of the days of Black when attempts were made to modify pulpal injury by the use of the following:

> Ivory, quill, gutta-percha, asbestos, plaster of Paris, goldbeater's skin, collodion, court plaster, tissue paper saturated with a solution of Canada balsam, lacto-phosphate of lime, and, finally, oxychloride of zinc, oxyphosphate, and oxysulfate of zinc.

The mistake they made was in leaving the invaded tubules as potential sources of irritants.

My objection in pulp capping over small exposures is the danger of secondary dentine deposits continuing to deposit beyond bounds, thereby further restricting the pulp space. Secondary deposits are nomadic and have no final resting limitations; a little irritation and they grow on whatever place will have them within the tooth.

CONCLUSION

In presenting this paper I do so with tongue in cheek realizing that men were hanged for less heretic practices. Pressure relief is sound fundamentally. Prognosis is favorable in early stages before stasis. Significant are the reports of Wedl, Tomes,[15] Salter, and Harris that inflammation is often seen before exposure. Simple pulpitis is of short duration, and relief must be given promptly or pathology will follow the general pattern by continuing toward the apex.

The differential diagnosis between acute and chronic pulpitis, often hair-lined and uncertain, may be the accompaniment of periosteal manifestations in the latter. Inflammation may be limited to the site of injury, so "open and drain" before lateral spreading takes place. The literature abounds with suggestions as to the differential residing in the caliber of pain. This, too, is uncertain and speculative. The stimulus which causes pain may not be of greater magnitude than that which is daily experienced by the organism; yet, from frequent repetition, a condition is reached in which before recovery from one stimulus the organism receives another, and so on.

Each stimulus leaves a little of its irritative quality until the tension from the accumulation of the irritative remnants becomes too great, and release of nervous energy takes place in the cell, the pain threshold is reached, and the sensation of pain results. Once having overcome the threshold, secondary discharges take place on a slighter provocation. Hence pain, the x-ray, and the pulp tester frequently confuse the picture, as witness the case wherein a non-vital tooth, densely calcified, gives a positive reaction.

Also untenable is the indefinite dividing line between histologic and pathologic secondary dentine. One often leads into the other without notice of demarcation, or clinical signs. Hyperemia and/or inflammation are independent of caries.

Our job is to keep the large, thin-walled veins in the pulp open and unobstructed for them to carry out their physiologic function of carrying nutrition to the pulp, and carrying away waste and effusions. When a tooth is lifted from its socket it suggests the removal of waste products and a slight damming. Hyperemia may occur without exposure, proving that terminal irritation may

cause dilatation to central organ. Depletion and room for expansion are the answers.

I like to treat every hyperemia as an inflammation; here again the dividing line is theoretical and impractical. Vessels in the pulp are injured by distention and the smaller ones run the risk of thrombosis, so why wait? The pulp is no longer an "untouchable." When the general surgeon can open a large vessel to overcome arteriosclerosis, we dental surgeons certainly ought to open the way for an entombed pulp gasping and throbbing for breathing space.

Practitioners will say that these are extreme measures; extractions are more extreme. The dental pulp is more susceptible to hyperemia and destruction than any other organ in the human body, what with thousands of terminal end openings for irritation purposes. Inflammatory exudates may either reform tissue in resolution, or degenerate further into pus.[4]

Draining off the extravasations and other migratory processes and products of bacterial metabolic activity is merely putting into practice the histopathology we dental surgeons were taught and expected to use.

"Of the ability of the dental pulp when placed in a good hygienic condition to recover from inflammation there can be no doubt" (Black[12]). Nature provided only one way by which the additive factors may drain out of the pulp and that is through the apical foramen. In hyperemia and inflammation this avenue is ridiculously inadequate, and is made more so by the added tenants that have assumed squatter rights, the leucocytes, blood serum, red blood cells, and various and sundry enzymes and agents aiding in recovery. What is more biologic and hygienic than creating an additional opening for drainage under surgical asepsis?

Pus pockets have been found deep in the pulp with no perceptible change in vitality of odontoblasts. It is my belief that the workability of the pulp testing procedure depends in great measure on the vitality of these odontoblasts which touch every portion of the tooth. Pathologists have shown ground sections wherein the entire central portion of the pulp has been destroyed via infection following the central course of the large veins, with the odontoblasts normal and vital. This explains in part the vast discrepancies found in the pulp test recordings.

Cases have been reported of vital response of teeth whose chambers are almost obliterated via formations of secondary dentine. No matter how heavy the deposits, if tubules are present, the electric response will be there. In decalcified sections of dentine covering the pulp, the tubules are filled with saprophytic and pyogenic organisms.[1] The pulp, too, is invaded; hence opening into the organ will hardly increase the pathogenesis of an already pathogenic pulp.

Infections of the face are rare because of its vascularity and *ability to swell and expand*. The mastoids cannot swell, and their topography near the brain makes any "open and drain" technique a risky one, yet ear, nose, and throat men never have stopped "open and drain" when necessary. The pulp has tremendous defensive powers, if we only let it expand to defend itself. Its defense depends on its ability to swell under congestion.

Inflammation, strangulation, and necrosis—what a lot of teeth are condemned to extractions because of this trinity. Damaging the tubules may produce a barrier of tubuleless dentine; decay, however, does not need tubules; it progresses much like through the cementum via layers (Gottlieb,[5] p. 205). A great many pulpotomies will not be necessary if the chamber is drained of all products of inflammation and then sealed as stated.

Some day I would like to see the Kronfelds, the Gottliebs, the Orbans, and a host of others report on the relation of head pains, preferably the neuralgias, the migraines, and neuritis, to pressure induced by secondary dentine upon the pulp in pulp capping and pulpotomies.

Interesting to note is that migraine has recently been reported traceable to ischemia; neuralgia is without recognizable pathology. Secondary dentine causes ischemia in the pulp by its pressure either in the chamber itself or at a locus somewhat removed along the long lines of communication (tubules).

In every dental office there are dozens of cases wherein headache, fullness, and pressure pains have subsided with the extraction of a given tooth. The clinical picture is always the same; there is no discernible pathology by x-rays, the pulp test (?) indicates a modified threshold of irritability, the appearance of the surrounding mucosa is good, yet the patient is relegated to loads of APC's.[29] These may well be the "ischemic" cases.

Then there are the perfect root canal fillings, the kind that glamorize the clinician's slides. How many patients, by the extraction of these apparently innocuous-looking teeth, have been relieved permanently of ungodly and persistent head, neck, and shoulder pains. In the absence of definite pathology the answer may well lie in the phenomenon of hypersensitiveness induced by the antigen-antibody reaction to bacterial products (protein). Here may be found the real etiological factor between cause and effect.[22]

Gottlieb[5] reports that "the brownish yellow discoloration (dentine) is harmless and should be left over the pulp." He "cannot imagine that microorganisms can live in such a highly calcified dentine."

The tubercle bacillus, too, is walled off in the lung by heavy calcific deposits, yet its virulence is held in check until the patient's resistance makes matters favorable for further invasion. Even in chronic pulpitis the lesion may be walled off in the bulbous portion of the organ, and for a time may be dormant only to flare up suddenly; or it may serve as a nidus and offer admirable culture media for other organisms.

Neither secondary dentine with tubules, nor the highly calcified strip between the primary and secondary dentine are bars to caries invasion (conceded by all authorities). Zander[18] disclosed ground section showing bacterial invasion penetrating into and beyond tubules impregnated with silver nitrate.

Recently the pendulum swung toward the "impregnation of teeth" against caries. This is as pernicious as the extraction vogue that swept through orthodontic ranks. Every bimaxillary or receding chin was treated by sacrificing the first premolars (Tweed[21]), contrary minded regimented behind Hellman,[22] with both sides accusing the other of incompetence.

Gottlieb urges impregnation technique using a 50 per cent solution of zinc chloride and precipitated with K ferrocyanide.

Gorgas[26] has this to report on zinc chloride:

> It contains traces of arsenic; is a powerful and penetrating caustic, on contact with living tissue it destroys their vitality and on contact with albuminous and gelatinous matter forms an eschar on account of its affinity for water.

On page 1168, the United States Dispensatory reports on the use of zinc chloride:

> It is used in cancerous affections, liberates HCl, has traces of arsenic, is hydroscopic, and a 2% solution will destroy vegetative matter.

It would appear that the use of zinc chloride for impregnation would constitute harsh and unusual treatment for an organ whose topography, sensitiveness, and vulnerability demand the zenith in gentle and kind care. Too great a plea cannot be made for the deletion from our drug list of all the protoplasmic and hydroscopic vehicles.

The reaction of some of my colleagues to my technique can be best described in one word, "drastic." My answer is, "Relegating a tooth to extraction, or pulp extirpation and/or pulpotomy, is drastic too."

Though the following has no direct bearing on the thesis at hand, it illustrates the points advanced, particularly the "drastic" imputation. The fact that certain techniques have been practiced for many years is no valid argument for their continuance in the face of overwhelming and unimpeachable evidence to the contrary. My practice is given over largely to surgical prosthesis, either obturators or facial replacements of tissue lost to cancer. Most surgeons in doing a maxillary resection, including the lateral wall and floor of the nose, will retract the cheek to unmerciful limits. Not only is vision obscured, but also the cheek in question is brutally traumatized with resulting tissue contraction and horrible disfigurement. I have seen patients with cheek openings through to the oral cavity. The better technique is to split the lip to the columella, across to the ala, then up along the nasolabial fold to and under the inner canthus, and laying it all back. This gives the surgeon plenty of light and he sees where he is going. The tissues heal almost without a scar. "Drastic"? Yes, it is drastic. All operative and surgical procedures are drastic. The end result counts, and that is the important thing.

Another illustration indicating that what may appear "drastic" often gives better results is the exenteration of the orbit case (Fig. 5). Here you see an unsightly swelling under the infraorbital ridge due to lymphatic damming. To the prosthetist this is a serious drawback because one cannot construct a restoration symmetrical with the other side if there is an edema to start with. The edges of the facio-orbital replacement rest on the surrounding swollen tissues, and the disparity is an eye-sore.

This presented a perplexing problem since esthetic facial prostheses are terrific morale boosters. I have requested the various surgeons to take off more tissue, thereby leaving a depression instead of an elevation. Then it is not difficult to cover all imperfections with an eye toward symmetry and balance. Still there are many cases on whom the first technique was used with frightful resulting appliances.

The last illustration concerns situations in dental offices when "matching" of teeth is attempted. Times without number the dentist tries matching only to find his perfect match, a mismatch under other illuminants. The fault lies with the "spotlight" manufacturers who lack inclination to correct a flagrant abuse. The use of one operating light for matching purposes is at variance with all accepted and established principles of lighting in color matching. Admittedly, a tooth contains sections of color appearances of yellow, red, and blue; hence it runs the gamut of the visible spectrum from 400 mμ to 700 mμ (yellow, orange, red, green, blue, and violet). In matching yellows, an illuminant rich in the blue portions of the spectrum will enable the operator to discriminate yellows better than under a yellow illuminant. (The tungsten lamp is notoriously rich in yellow and so should be avoided in color matching.) In matching blues, the illuminant rich in energy in the red and yellow portions of the spectrum is indicated.

Fig. 5.

This is on all fours with the accepted principle as enunciated by Taylor,[28] and is generally used throughout the color industry. The Inter-Society Color Council has reams of literature on the subject. The practical application to the dentist of the above is the use of two lamps, each at the extreme color temperature of daylight, one at about horizon daylight at 2,900° K., the other at 7,500° K., with a transmission wave length at about 620 mμ to 700 mμ. The latter has the energy distribution similar to daylight at the higher limits (the yellows and the reds). A subsequent report to be released by the author will go into detail on this subject.

The amount of light is not as important as the quality. Hence, men operating in offices flooded with natural daylight will find the clear blue sky glaring, with the amount of illumination decidedly inferior to that of the slightly cloudy and overcast sky. The northern light, so desirable, is offset and changed in caliber by the erection of new buildings and the reflection from the red bricks. Weather, too, may be bad. Matchers of teeth will find that a match made in one part of the room will be a mismatch in another part. This is due to the fact that offices with natural light lack proper diffusion. Also, a match made in the morning has a different appearance in the afternoon. Equally annoying is the changing in the appearance of a color match with every hour between 9 A.M. and 4 P.M. This considerable hourly change demonstrates the uncertainty of natural daylight color matching.

The candle power above one hundred has little advantage, and so should be about 60-80. Here we dentists are continually trying to match colors under a set-up that makes matching as simple as trying to get the winds to subside or the seas to recede.

In conclusion, I remember the time when an administration of 5,000 units of penicillin was a large dose; then the 250,000 unit doses came along; and now we have the 3,000,000 to 4,000,000 heroic doses. Yes, "drastic" as a term has undergone metamorphosis and is of elastic connotation.

REFERENCES

1. Appleton, J. L. T.: Bacterial Infection, Philadelphia, 1933, Lea & Febiger.
2. Burchard, H. H., and Englis, O. E.: Dental Pathology and Therapeutics, Philadelphia, Lea & Febiger.
3. Grossman, Louis I.: Root Canal Therapy, Philadelphia, 1940, Lea & Febiger.
4. Cahn, L. R.: Basic Principles of General and Oral Pathology, Dental Items Interest Publishing Co., Inc., 1929.
5. Gottlieb, B.: Dental Caries, Philadelphia, 1947, Lea & Febiger.
6. Bernier, Joseph L., and Ash, J. E.: Atlas of Dental and Oral Pathology, Army Institute of Pathology, Washington, D. C.
7. Marshall, J. S.: Operative Dentistry, Philadelphia, J. B. Lippincott Company.
8. U. S. Dispensatory, ed. 21, Philadelphia, J. B. Lippincott Company.
9. Bailey's Histology, Baltimore, 1940, Williams & Wilkins Company, p. 417.
10. Thoma, Kurt H.: Oral Diagnosis and Treatment Planning, 1936.
11. Zinsser & Bayne-Jones: Textbook of Bacteriology, New York, 1928, D. Appleton-Century Co., Inc.
12. Black, G. V.: American System of Dentistry, Lea & Brothers.
13. Orban, B.: Histology of the Enamel, Lamellae and Tufts, J. Am. Dent. A. 15: 305, 1928.
14. Kronfeld, B.: Histopathology of the Teeth, Philadelphia, 1939, Lea & Febiger.
15. Tomes, C.: System of Dental Surgery.
16. Muller: Introduction to the Study of Bacterio Pathology of the Dental Pulp.
17. Von Beust: Dental Cosmos, June, 1912.
18. Zander: J. D. Res. 18: 373, 1939.
19. Hopewell-Smith: Histology and Pathohistology.
20. Rackeman: Clinical Allergy, New York, 1931, The Macmillan Company.
21. Tweed, Chas.: Indications for the Extraction of Teeth in Orthodontic Procedure, Am. J. Orthodontics and Oral Surg. 30: 405-425, 1944.
22. Hellman, Milo: Fundamental Principles and Expedient Compromises in Orthodontic Procedures, Am. J. Orthodontics and Oral Surg. 34: 18-27, 1948.
23. Osgood, E. E.: Laboratory Diagnosis, Philadelphia, 1942, The Blakiston Company.
24. Behan, R. J.: Pain, New York, 1926, D. Appleton-Century Co., Inc.
25. Kaletsky, T.: Management of Traumatized Pulps, Am. J. Orthodontics and Oral Surg. 30: 93-97, 1944.
26. Gorgas, F. J.: Dental Medicine, Philadelphia, 1902, The Blakiston Company.
27. Bodecker, Chas. F.: Enamel Fissure Decay (Chart).
28. Taylor, A. H.: The Nature and Causes of Small Color Differences in Industry. Lighting for Their Detection, Am. J. Optical Soc. 32: 651-658.
29. Brauer, J. C.: Dentistry for Children, Philadelphia, 1939, The Blakiston Company.

89-41 215TH STREET.

Editorial

Specialization

Specialization in dentistry started in America, and one of the first departments of dentistry in which men limited their practices was the department of orthodontics. That date coincided with the start of the rapid advance of orthodontics. Before specializing, it became the custom for men to serve a reasonable length of time with a recognized specialist, or if not that to take a formal course of instruction under an experienced orthodontist. That was presumed at least partly to qualify the student to be a specialist in the work.

In the beginning the only way the student could obtain highly specialized training was from a private practitioner who had made a record in the specialty.

Now something else is happening in America; there is a great urge surging for certification of specialists by an American Board in various special fields of practice. Such a Board is presumed to be qualified to say when a man has advanced in skill and training up to the point where the Board can say, as evidenced by examination and certificate, that in the opinion of the Board the candidate is well qualified to practice in his own name. The certificate idea is rapidly growing in prestige in the eyes of both the profession and the public. The first question asked now about a specialist in either medicine or dentistry is, "Is he certified?" The answer "yes" implies much the same as does C.P.A. in public accounting. It means just what it says, certified by authority, as to competency.

The increasing importance of these boards has created a situation wherein the unprepared specialist finds it requires no small amount of courage to declare himself to be a specialist who presumes to know much more about a highly specialized subject than does his confrere, unless he has first taken the pains to prepare himself carefully in study for such a role.

Most of the specialty boards in dentistry are now approved by the Council on Dental Education of the American Dental Association, and that puts more "teeth" in the position of the Board in any specialty because it makes for certification by a certified Board of the basic profession.

No better evidence is needed to reflect the trend established by the American Board of Orthodontics than to note the quality of many of the manuscripts prepared for the purpose of certification. It will be found particularly this year that several of these papers are of sufficient quality for publication in the AMERICAN JOURNAL OF ORTHODONTICS, for the benefit of its readers, many of whom have been specialists for years.

The requirements governing certification as a specialist by dental boards are now pretty well established, and they are not easy. A candidate must spend

several years in the specialty, two years of which must be devoted to training in an approved institution such as a dental school or hospital. Under some conditions, however, one year may be spent under an approved preceptor who himself is a certified specialist.

For the most part courses are confined to clinical subjects and are designed to provide the dentist with a fuller knowledge of some special branch of his profession than is available to him in school where he earns his D.D.S. degree.

At the inspiration of the late Dr. A. H. Ketcham of Denver, the American Board of Orthodontics was the very first board established in dentistry. Now with a background of many years of unselfish devotion behind it, its influence is being felt vigorously. It will not be so long that in order to become a recognized specialist in orthodontics the candidate will either have served several years of experience in the specialty along with a good record, or he will have been certified by the American Board of Orthodontics. This all adds up to the purpose that Dr. Ketcham had in mind when he first conceived the idea of the Board—in short that if orthodontics is to take its place along the side of pediatrics and other important specialties in health service, its workers must be carefully trained for the job and not self-appointed and without sufficient training.

The unselfish efforts of members of the American Board of Orthodontics over a period of years are now becoming increasingly manifest in the high quality of theses, that are presented before this Board. Theses of this character are not created without long and careful study and preparation.

H. C. P.

In Memoriam

HOWARD L. JONES

1881-1949

Howard L. Jones, of Detroit, Michigan, died suddenly from a heart attack on the evening of July 5, 1949, at the age of 68. During the last three years of his life he served as half-time visiting lecturer on the graduate staff of the Orthodontic Department of the University of Michigan School of Dentistry.

Dr. Jones was a graduate of Valparaiso University in Indiana. After his graduation he served as principal in one of the public schools in South Dakota and then spent several years as a teacher in the public schools in the Philippine Islands. He later took his freshman year in dentistry at the University of Minnesota, and then transferred to the University of Michigan and received his D.D.S. degree there.

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Dental Effects of Community Waters Accidentally Fluorinated for Nineteen Years. II. Differences in the Extent of Caries Reduction Among Different Types of Permanent Teeth: By Henry Klein, *Pub. Health Rep.* **63**: 563-573, April 30, 1948.

This article points out the protective nature of fluorinated water supplies by comparison of specific types of teeth among 2,000 children residing in New Jersey and 6,000 children of Hagerstown, Maryland.

The children born and reared in the area whose water supply contains 1 to 2 parts per million of naturally occurring fluoride have a lower caries experience than those reared in a nonfluoride area. Furthermore, children who migrate into a fluoride area are protected against caries attack, but to an extent which is fairly closely dependent upon the age at the time of arrival and the length of residence in the fluoride area.

It is well known that the different kinds of teeth (incisors, cuspids, bicuspids, and molars) are subject to different degrees of characteristic susceptibility to dental decay. The molars are most frequently attacked and the cuspids least often involved. The question posed by the author is, "Are all teeth protected to the same extent or are some teeth protected more than others?"

It was found that although the anterior teeth are least susceptible to caries they nevertheless received the greatest degree of benefit from exposure to fluorinated waters. The bicuspids are somewhat less benefited, and the molars, which are the most susceptible to caries, are the least benefited. It should be emphasized that quantitatively the molars are responsible for the greatest amount of dental caries but that the relative protection is here being considered. It seems that the differences in caries reduction are probably related to the characteristic susceptibility, and the tooth with the strongest natural resistance obtains the greatest degree of protection from exposure to fluoride, while the tooth having the least resistance obtains less protection.

From a practical point of view, the findings direct attention to the fact that even after prenatal exposure and a postnatal residence of fifteen to nineteen years in a fluoride environment, caries attack is reduced only by about a third of normal expectation in the lower molar teeth of lifetime residents. Although this is a significant reduction, particularly from the point of view of the total need for the dental service in the population, it is necessary to recognize that approximately two-thirds of the treatment problem for caries still arises among molars. The need for dental treatment of children is still very great, and fluorination of water supplies by itself cannot control dental caries.

H. C. SANDLER.

The Age-Incidence of Defects in School Children, Their Changing Health Status: By C. H. Maswell and W. P. Bronx, *J. School Health,* vol. 18, pp. 65-80, 1948.

The incidence of physical defects in the children of New York State (exclusive of New York City) seems to have shown remarkable improvement in almost every category in the last decade. Dental defects, however, seem to have increased. All defects other than teeth decreased from 561 to 382 per thousand children. Dental defects increased from 344 to 436 per thousand children. This increase is probably more seeming than real, since the type of dental examination in schools has improved greatly in the past ten years and many more dental defects are being found which were previously overlooked.

It is of considerable significance that the number of children with dental defects is about equal to the numbers with all other defects put together. In general, as the child grows older, a higher percentage of physical defects are brought under professional care and at the end of high school there are few significant untreated defects. In the case of the dental defects, about 7 per cent of children still required professional attention upon graduation from high school. On the whole, for all ages, 67 per cent of the children with dental defects had been treated, thus leaving 33 per cent who still need dental care.

H. C. SANDLER.

A Mouth Screen for Use After Adenoidectomy: *Brit. M. J.*, July 24, 1948.

Professor E. Matthews, Honorary Prosthetic Dental Surgeon, Manchester Royal Infirmary, writes: "At the clinical meeting of the Manchester Medical Society held in June, 1947, I demonstrated the use of the mouth screen or oral shield as a form of follow-up treatment after the removal of adenoids—the object being to correct the mouth-breathing habit. I found a considerable interest taken in this simple appliance, and have since had requests from several doctors for advice for their own children.

"The appliance can easily be made from a sheet of 'perspex' or celluloid moulded to shape, or from the moulding powders used in denture construction. The only requirement is an impression of the labial surface of the upper and lower teeth as far back as the first molars. The idea is by no means a new one, and some dental surgeons have for long used the mouth screen as a simple but effective orthodontic appliance for the treatment of overprominent front teeth. The appliance is of course only used at night, and functions as a valve. It prevents mouth-breathing, since in the act of breathing in through the nose it moves into contact with the gums, thereby acting as a seal. The inward movement is conditioned by the slightly reduced pressure (below atmospheric) in the oral cavity during the act of breathing."

Professor Sprawson (Brit. D. J., vol. 83, p. 231, 1947) states: "Many still appear to think that if the nasal obstruction is removed that is all that need be done, but experience does not bear this out. During the day nasal breathing may be reestablished if the child is admonished when seen with its mouth open, but it invariably reverts to mouth-breathing at night, and unless treated this habit will persist throughout life." He also comments on the association of an anterior gingivitis with the mouth-breathing habit, and insists that "it is a serious complaint because it is almost always a precursor of parodontal disease, with its oral sepsis and early loss of teeth."

There are, therefore, important dental and developmental reasons why every care should be taken to see that the mouth-breathing habit is properly cured after the immediate cause—adenoids—has been removed. It would be interesting to know what steps are ordinarily taken by one's E. N. T. col-

leagues to terminate this habit. The use of sticking-plaster over the lips is an obvious but usually unwelcome solution of the problem, and therefore for the majority of cases I subscribe to Professor Sprawson's dictum that "every child who has the adenoid operation done needs this treatment (oral screen), as otherwise the habit persists."

Facial Form and Biting Pressure: By John Heath, L.D.S.R.C.S. (Eng.), *Australian D. J.*, July, 1948.

An analysis was made of radiographs of the heads and faces of pure blood aboriginal children aged 4 to 18 years examined at the Hermannsburg Mission and the Haast Bluff Reserve in Central Australia by members of research expeditions in 1946 and 1947.

The relation of the mandible to the maxilla was established from a combination of measurements of incisal overjet and overbite, examination of cuspal wear, interdigitation of models, and actual photographs of the occlusion of each case. The occlusal relation of aboriginal children has been shown to vary from "edge to edge" of incisors to Class II, Division 1 malocclusion.

The face of the Class II, Division 1 civilized child is retruded dorsally toward the cranial base compared with the prognathous face of the aborigine. The angles which the lines from nasion to the maxillary central incisor tip make with the cranial base lines are 68° : 75°.

The chin angle, at gonion, is smaller in the civilized than in the aborigine child by 73° : 89°. However, the angles nasion-central incisor tip-gnathion are similar, 142° : 145°.

The aborigine, in his native state, tears food forcibly apart with his anterior teeth before transferring it to his posterior teeth for mastication. The civilized child has his food softened, breaks it up with implements, and frequently completely by-passes his anterior teeth when feeding. Frequently, little mastication is necessary.

It was possible at the Haast Bluff Reserve (where the full blood aboriginal children eat chiefly their ancestral tribal diet "off the land" with no agriculture or domestication of animals for food) and at Hermannsburg (where similar full blood aborigines eat chiefly civilized food) to compare the biting pressures of the two types. The Hermannsburg Mission has been in existence for seventy years.

In central Australia the biting pressures of the aboriginal children were taken by the writer and R. S. Gargett, on two places: (1) on the central incisors, (2) on either the last deciduous molars or the first permanent molars.

All possible precautions and steps were taken to assure that each child could and did exert his or her maximum biting pressure. The biting pressure was greater at Haast Bluff (native food) than at Hermannsburg (civilized food).

These variations are submitted as significant. The children live 89 miles apart, and the chief difference between them is their food. The greater variation in biting pressure is in the incisor region.

Anthropologic literature suggests that the change from the primitive methods of tearing food with the anterior teeth to the use of cooking and cutting implements (as a result of which the anterior teeth are "by-passed") bears a causal relationship to the evolutionary recession of the face.

Comparisons are drawn between the facial angles of pure blood Australian aboriginal children and those of civilized children with Class II, Division 1 malocclusion of the teeth, compiled from lateral head and face radiographs

taken by the approved method. Gnathodynamometer measurements are recorded of two groups of aboriginal children with different biting and chewing methods.

It is suggested that there exists a causal relationship between the evolution of the facial morphology and that of biting and chewing methods and food preparation, with consequent altered biting and masticatory forces.

Die Bandlose Falt-Apparatur, Beschreibung einer neuen kieferorthopädischen Apparatur nebst KRITIK an den Plattenbehelfen, besonders der sogen. "Funktionskiefer-Orthopädie." (The Bandless Malocclusion Apparatus. Description of a New Jaw Orthopedic Apparatus and Critique of the So-called "Functional Jaw Orthopedics.") von Professor Dr. Paul Simon, Konstanz, ehem. Leiter der kieferorthopädischen Abteilung des zahnarzt., Universitäts-Instituts zu Berlin—Mit 76 Abbildungen Verlag-Zahnärztliche Welt, G.m.b.H., Konstanz, 1947.

The greater part of this work appeared in the magazine *Zahnärzliche Welt,* during 1946, under the title "Uber eine neue bandlose Falapparatur für die Kieferorthopädie."

It is the intention of Professor Simon to present a practical handbook in the technique of the bandless apparatus for dentofacial orthopedics which would not require materials, equipment, and instruments that were not obtainable in Europe, especially during the war years. The apparatus is made of Wipla metal and is not removable by the patient. It consists of a combination of labial and lingual arches which can be adjusted as required. Auxiliary strings are not used, except as extremely thin wires in the labial arch. This reviewer can see nothing new in the appliance described by Simon. It consists of a W-shaped spring with the closed end toward the incisors. The spring is held in position by what we would term a "crib clasp," which fits over the second premolars and in the deciduous dentition over the first deciduous molars. The free ends of the W-shaped wire are used to expand the arch.

In general the appliance takes in certain of the features of the Coffin spring, the lingual appliances, and the old V. H. Jackson appliance. Throughout, anchorage is practically nonexistent. To the free ends of the W are attached elastics for the correction of the irregularities of the incisor teeth. One can only wonder whether any of the appliances shown on pages 25, 26, 27, and 28 were actually used in the mouth, and if so how much harm they did to the patient. For example, Fig. 15 shows an appliance which could produce almost anything except the desired result of lining up anterior teeth. A bite plane which fits over the maxillary incisors is used by Simon. This has an attachment to the lingual arch for the correction of deep overbites. However, attempts to anchor the appliance to the lingual arch cannot do otherwise than produce jiggling and loosening of the teeth.

Simon differs with the so-called Norwegian appliance which Häupl popularized throughout Germany. It is Simon's belief that all pressure should be placed directly on the teeth.

News and Notes

Central Section of the American Association of Orthodontists

The regular annual meeting of the Central Section of the American Association of Orthodontists will be held Sept. 25, 26, and 27, 1949, at the Sheraton Hotel, St. Louis, Missouri.

EARL E. SHEPARD, Secretary, Lister Building, St. Louis, Missouri.

Northeastern Society of Orthodontists

The fall meeting of the Northeastern Society of Orthodontists will be held on Nov. 28 and 29, 1949, at the Hotel Commodore, New York.

Southern Society of Orthodontists

The twenty-fifth annual meeting of the Southern Society of Orthodontists will be held at the Roosevelt Hotel in New Orleans, Louisiana, from Sunday, Oct. 30, 1949, through Tuesday, Nov. 1, 1949.

American Academy of Pedodontics

The meeting of the American Academy of Pedodontics will be held Oct. 14 to 15, 1949, in San Francisco. Address inquiries to Elsie C. Schildwachter, Secretary, 6831 Seville Avenue, Huntington Park, California.

Central Section of the Pacific Coast Society of Orthodontists

The quarterly meeting of the Central Section of the Pacific Coast Society of Orthodontists, consisting of afternoon and evening sessions, was held Thursday, June 9, at the Alexander Hamilton Hotel.

Members present were: J. Elliott Dunn, Bill Walsh, Ernest Johnson, Harry S. Thompson, Reid M. Van Noate, K. Terwilliger, Fred T. West, Roy Cowden, E. Watkins, Art Skaife, Lyle D. Russell, William Sheffer, Arthur J. Corbett, Ray Curtner, Fred Epley, Vernon L. Hunt, Nick Carter, Ray Lussier, Howard Dunn, William Smith, Seymore Gray, Carl O. Engstrom, H. Jan, Kester Diment, Fred Wolfsohn, Harold Bjornstrom.

Guests: G. M. Fitzgerald, Lloyd M. Cox, H. R. Foster, William A. Elsasser, J. R. Seaman, George Merchant, Alan Cass, F. W. Heitman, Jr., Eugene E. West, W. R. Campbell, W. S. Parker, Susan Locke, Haig Albarian.

For the afternoon session, Chairman Lyle Russell presented Program Chairman Roy Cowden, who in turn presented Dr. Clarence O. Simpson, Professor of Radiodontics at Washington University, School of Dentistry, St. Louis, Missouri, whose subject was "Radiographic Service for Orthodontic Patients." In the afternoon session he explained, by demonstration methods, how to obtain excellent radiographs to those who are making their own radiographic examinations. The demonstrations were supplemented by detailed information in the use of radiodontics.

After this short business session, the meeting was again turned over to the program chairman who reintroduced Dr. Clarence O. Simpson. The evening meeting was given over exclusively to radiodontic interpretation showing pathologic changes, caries, abnormal tooth

positions, etc., as well as normal patterns of many orthodontic patients whom he attends. This part of the meeting was particularly enlightening, and I am sure that everybody actually felt that he gained a lot in attending. Dr. Simpson, besides being well versed in his subject, is an authority on radiodontics and has also written a textbook on radiodontic interpretation. His manner of presentation, coupled with his excellent humor, made this an outstanding program and one to be long remembered.

Southern Section of the Pacific Coast Society of Orthodontists

The regular quarterly meeting of the Southern Section of the Pacific Coast Society of Orthodontists was held at the Rodger Young Auditorium, 935 West Washington Boulevard, Los Angeles, California, June 10, 1949.

The meeting was called to order at 2:30 P.M. by Chairman Sydney Cross, who presented the Program Chairman, Mahlon Adams.

The following program was presented:

Dr. Clarence O. Simpson, Professor of Radiodontics at Washington University School of Dentistry, St. Louis, Missouri, and author of the textbook *Advanced Radiodontic Interpretation,* gave demonstrations and lectured on "Radiographic Service for Orthodontic Patients."

After a social hour and dinner, Dr. Simpson presented a paper entitled: "Interpretation of the Normal and Anomalous Dentition."

Following the evening presentation, the business meeting was called to order by Sidney Cross.

Note: Sydney Cross reported that a committee composed of C. F. S. Dillon, Sydney Cross, Ben Reese, Fred McIntosh, and Robert Whitney had been appointed to appear before the Board of the First District Dental Society of the Southern California State Dental Association to present the case for the Pacific Coast Society of Orthodontists, Southern Section, concerning the Barnes orthodontic program which is being started despite the disapproval of the Southern Section.

Twenty-First General Meeting of the Pacific Coast Society of Orthodontists, Palace Hotel, San Francisco, Feb. 22, 1949

Report of Round Table on Retention

Three tables of ten men each, or a total of thirty, entered into the discussion.

Several questions were considered and a vote taken on each question. The following questions, answers, and opinions were given:

Q. Number using Kesling tooth positioner in majority of treated cases.

A. Three using positioner, always followed with regular retention.

Q. The use of both upper and lower removable (Hawley) appliances, also lower cuspid-to-cuspid fixed retention.

A. All used upper removable; three, or 10 per cent, used lower removable in all cases. One hundred per cent used lower removable occasionally; twenty-seven, or 90 per cent, used cuspid-to-cuspid retention on lower teeth.

Q. Approximate time of retention and how determined.

A. Six, or 20 per cent, retainers worn only nights for indefinite period. One discards all retention after eight to twelve months in majority of cases.

Twenty-four, or 80 per cent, after six months of twenty-four-hour retention recommended about one year of nights only (ten hours) to reduce

gradually to every other night, then one night a week if retainer still fits, showing no tooth movement.

All retention is discarded after patient has successfully married a good-looking, wealthy mate. What more could they expect?

Cuspid to cuspid retention is worn from two and one-half to several years depending upon position and retention of lower third molars.

Q. After removal of four first premolars, what retainer is used to retain contact of teeth?

A. Four, or 16 per cent, extracted in about 50 per cent of cases. Removable appliances used to hold teeth in approximation. When spaces appear in spite of retention, these are considered borderline cases and possibly teeth should not have been removed.

Q. Are external pressure and muscle exercises considered in treatment and retention?

A. Six recommended and insisted on muscle exercises where indicated or in most cases.

All thought that external pressure habits were a predisposing factor in the collapse of many successfully treated cases.

Summary

If external pressure is the cause of the collapse of many of our successfully treated cases, why do we not do something about it? It would be so easy to extend wires from our appliances, also heavy wires from our retaining appliances, which would make external pressure very uncomfortable. Let us all work on this idea.

As leader of the round table "Retention," I thoroughly enjoyed the assignment, and I assure you that it was highly profitable to me.

WALTER J. FURIE.

EXCERPT FROM A LETTER FROM ESSAYIST DR. J. P. WEINMANN TO DON MACEWAN

"During the round table meetings, some of your friends asked me the question 'whether after extraction of a tooth should teeth immediately, or only after a long interval, be moved into the gap.' After returning to Chicago I found out that I answered the question in a very similar way as Doctor Sicher would have done. I promised your friends an answer to this question after discussing it with Doctor Sicher. Here it is:

"The question of moving a tooth into the space of an extraction wound has never been examined experimentally. However, from what we know about the process of healing of an extraction wound it seems that the orthodontic movement can be started immediately after the surface has healed over, provided that the septum between the empty socket and the tooth that is to be moved is not injured. In this case, the changes of the bone reconstruction would simulate the changes occurring in the labial alveolar plate during labial tooth movement. The situation in movement toward empty socket would be quite favorable because the bony septum is bounded by the young

connective tissue in the healing socket, a tissue that has great osteogenic potentialities."

In case all California members have not heard—Governor Warren signed the bill excusing children from school for dental services without loss of attendance.

American Association of Orthodontists

At the May meeting of the American Association of Orthodontists, two men whose names did not appear in the printed program gave table clinics. (Their acceptances were not received until shortly before the meeting and were too late to be printed.)

These two were: Dr. Bernard Kniberg, of Elizabeth, New Jersey, and Dr. Brooks Juett, of Lexington, Kentucky. The title of Dr. Kniberg's clinic was "A Simplified Technique for Processing Acrylics in the Office." The title of Dr. Juett's clinic was "The Economical Construction of Hawley Retainers."

Thomas P. Hinman Mid-Winter Clinic

The Thirty-seventh Annual Meeting of the Thomas P. Hinman Mid-Winter Clinic will be held at the Municipal Auditorium, Atlanta, Georgia, March 19, 20, 21, and 22, 1950. The general chairman is Dr. Sidney L. Davis, 932 Candler Building, Atlanta, Georgia, exhibit chairman, Dr. J. A. Broach, 1105 Doctors Building, Atlanta, Georgia.

Northwestern University

Northwestern University Dental School announces that Arne Bjork, of Västerås, Sweden, the author of "The Face in Profile," has accepted a three-month teaching and research fellowship in the Department of Orthodontics beginning in the latter part of October.

Dr. John R. Thompson, Director of the Department of Orthodontics, announces that a graduate seminar on orthodontics will be held November 28, 29, and 30. Attendance is limited to graduates of the department and to those orthodontists who graduated from the Northwestern University Dental School before the graduate program was established.

On December 1 the staff of the Northwestern University Cleft Palate Institute will present a program on all phases of this problem for those interested in staying for the fourth day.

Toronto Orthodontic Study Club

In recognition of his contributions to orthodontics, Dr. A. LeRoy Johnson was recently elected an honorary member of the Toronto Orthodontic Study Club, on the occasion of his visit to Toronto when he addressed the members of the Club. Two other outstanding orthodontists, Dr. Robert H. W. Strang and Dr. George W. Grieve, have been similarly honored by the members of this active organization.

Dr. Robert E. Moyers, who assumes his new duties as Head of the Department of Orthodontics, Faculty of Dentistry, University of Toronto, on September 1, has been elected to active membership in the Club.

An unusually interesting and instructive program for the season 1949-1950 has been arranged by the officers, Dr. H. Colton Bliss, President, and J. T. Crouch, Secretary.

European Orthodontic Society

The European Orthodontic Society held its Twenty-sixth Annual Congress at the St. Moritz July 7, 8, 9, 10, and 11, 1949.

German Orthodontic Society

The German Orthodontic Society was newly established at the tenth meeting of German dental surgeons at Wiesbaden.

Officers of the society are:

President, G. Korkhaus, Bonn
Vice-President, H. Noltemeier, Hannover
Secretary, E. Hausser, Bonn
Treasurer, F. Ascher, München

The first postwar meeting will be held in Bonn on Oct. 29 to 31, 1949; the program of discussion will be "The Possibilities and Limits of Jaw Expansion."

Mouth Cancer and the Dentist

"Members of the dental profession hold a position of unique advantage in the early diagnosis and prophylaxis of cancer of the oral cavity," writes Dr. Hayes Martin a forthcoming brochure: *Mouth Cancer and the Dentist.* These tumors commonly occur in persons who enjoy apparently perfect health, and many have seldom, if ever, needed to consult a physician, at least for any complaint that would require a thorough examination of the oral cavity. *The medical profession is powerless to assist this group of people.*

This is not true of the dentist. He sees most of his patients once or twice a year for a thorough examination of the teeth, and so can scrutinize the oral cavity periodically under the most desirable conditions: he can inspect and palpate the tongue, floor of the mouth, gums, palate, and cheeks, and note on his records any departure from the normal. Such a routine examination would require but a few minutes and would undoubtedly be highly appreciated by the patient. Should the dentist detect anything that would point to cancer or a precancerous lesion, he can recommend and refer the patient for the necessary medical study.

If the dentist does not avail himself of this unusual opportunity for the early recognition of cancer, the irreparable loss to the patient and to the public health is obviously great. If he does, he may be able to help his patient avoid the great suffering incident to advanced and incurable cancer of the oral cavity—may be able to prolong life and fruitful living.

The brochure discusses in detail the lesions indicating cancer or precancerous conditions, the necessary steps to be taken by the dentist in the diagnosis of these suspicious lesions, and the indications and precautions to be observed, dentally, before and after treatment has been instituted for the cancer. This discussion is amplified and pointed up by a profuse number of illustrations both in black and white and in color.

Mouth Cancer and the Dentist will be published in October, 1949, by the American Cancer Society and will be made available to all dentists in the United States.

American Dental Association

(This is one of a series of feature articles written by Dr. Reuben L. Blake, of San Francisco, Chairman of the publicity committee for the ninetieth annual session of the American Dental Association which will be held in San Francisco from Oct. 17 to 20, 1949. In this article, Dr. Blake lists the large number of special events which have been planned as supplements to the scientific and business sessions of the annual meeting.)

So you have decided to come to San Francisco to attend your A.D.A. annual session, Oct. 17 to 20! You will never regret it for you will take home many thoughts of charming and fascinating San Francisco that will linger ever in your memories.

In addition to participating in one of the A.D.A.'s most important meetings, you will have an opportunity to become acquainted with the unique combination of old world and ultramodern atmosphere that is San Francisco. You will browse in fabled Chinatown with its pagodas, carved temples, and oriental bazaars. You will be enticed by the aroma of the

crabs and lobsters cooking in the sidewalk cauldrons of Fisherman's Wharf. You will enjoy a sea food dinner as you gaze on the Neapolitan fishing boats resting for tomorrow's run. You will thrill to the clang of the historic bells of the cable cars as they scale our steep hills.

A large number of special events have been planned for visiting dentists and their families. Some of these are:

International Night honoring President Clyde E. Minges will be held at 7:30 P.M. Wednesday, October 19, at the Palace Hotel. This will be the entertainment feature of the convention. It will consist of a deluxe dinner and a scintillating floor show direct from Hollywood. It will be an event you will never forget.

Chinatown tours: An escorted tour through enchanting Chinatown will disclose native jewelers, lantern makers, a Chinese theater, dim lantern-lit allies, and the Ming porcelain, jade, bronzes, ivory, and teakwood sculpture, tea, incense, and perfumes typical of the Far East yet 6,000 miles away.

Sight-seeing bus tours will take you daily through metropolitan San Francisco, visiting world-famous Golden Gate Park with 1,000 acres reclaimed from sand dunes into a paradise of drives, lakes, and groves. Here may be found the De Young Museum, rare and colorful tropical fish in the Steinhart Aquarium. Near by you may sip a cup of tea in the picturesque Oriental Tea Garden. Then you will visit our historical Cliff House, Presidio, Yacht Harbor, and the world's largest outdoor Fleischacker Pool and its adjoining magnificent zoo. From the top of Twin Peaks you may view the inspiring panorama of San Francisco with its famed 14 hills, or from the top of 200-foot Coit Tower on Telegraph Hill see its houses and apartments clinging to its clifflike sides, as well as our world-famous harbor and gigantic bridges. Also, trips may be made "down the peninsula" to Stanford University and across the San Francisco Bay Bridge to Oakland and Berkeley, the home of the University of California.

Boat cruise on San Francisco Bay will take you for three golden hours of thrilling adventure on the world's most picturesque and amazing harbor aboard a triple-decked steamer with deck chairs, cocktail lounge, hot lunch galley, souvenir counter, descriptive lecture, and transscribed musical programs. You will see "The Rock," or Alcatraz notorious prison island, Aquatic Park, Fort Mason, Army Transport Docks, fashionable Yacht Harbor, Palace of Fine Arts, the Presidio guarding our Golden Gate. You will pass beneath the Golden Gate Bridge, world's longest single suspension span. You will cross to Marin County's rugged shore line passing forest-thatched Angel Island, and circle the East Bay water front of Richmond, Berkeley, and Oakland. Circling Treasure Island, site of the San Francisco International Exposition, you will proceed to Hunter's Point Navy Yard; along the Embarcadero under the 8-mile long San Francisco Bay Bridge you will find the best view of San Francisco's gleaming skyscrapers, truly as spectacular and colorful a trip as you could take anywhere.

Through special permission a three-hour *Navy inspection trip* has been arranged to visit a battleship, submarine, or cruiser, and a tour of Hunter's Point Navy Yard.

A ladies' luncheon and fashion show by Joseph Magnin Company, Tuesday, October 18, will be at 12 noon in the Peacock Court and Room of the Dons, Hotel Mark Hopkins.

Personally conducted *ladies' shopping tours* will be held every day through the stores of magnificent, new I. Magnin & Co., and internationally known Gump's. Magnin's conducted one-hour tours start at 9:30 and 9:45 A.M. and will cover the entire store, including departments to which the general public is not admitted. Gump's entire store has been redecorated so it is now at its finest. These tours will start at 10:00 A.M. and 3:30 P.M. Gump's fabulous jade room will be especially opened for A.D.A. visitors.

COST OF EVENTS

The cost of these events is nominal. For International Night, tickets will be $10.00 per person, including the tax and tip. Sight-seeing bus tours will cost $3.18 per person; Chinatown tours will be $2.30 per person; the boat cruise, $2.88 per person, and the Navy inspection

trip, $1.75 per person. The cost of the ladies' luncheon and fashion show is $3.75 per person, and the shopping tours, 50 cents per person.

Reservations and checks for all events except those especially for women should be sent to Dr. Leon Moser, 450 Sutter Street, San Francisco 8, California.

Reservations for the two ladies' events should be made with Mrs. R. L. Blake, 3700 Ocean Avenue, San Francisco, 16, California.

Reservations for International Night, the ladies' luncheon and shopping tours are limited. To avoid disappointment, make your reservation early!

Do not expect too much from your new ammoniated dentifrice as a preventive of tooth decay. It is still in the experimental stage, the *Journal of the American Dental Association* said editorially recently.

Many of the claims now being made for the new dentifrices are not warranted by present scientific evidence, the *Journal* editorial stated.

"Whether ammoniated dentifrices will prove as effective in sweeping away caries (decay) as their advertisers have been in sweeping the country with glowing claims, time alone will tell.

"Meanwhile the public will have the privilege of being guinea pigs, the dentist will be extremely cautious in his recommendations and the purchaser will brush his teeth with tongue in cheek if such is physically possible."

The *Journal* said that while preliminary reports have indicated that the ammoniated preparations may help prevent decay, it will be at least another year or longer before sufficient tests have been carried out to provide a proper evaluation of the new products.

Because the new dentifrices may be effective, at least in part, the Association has not tried to discourage the public from using the ammoniated preparations.

Members of the dental profession, however, are viewing the current large-scale promotion of the new products with mixed emotions, the editorial said.

"Their hope that the use of the new formulas will control, partially at least, the destructive action of caries is tempered by apprehension lest their promised effectiveness prove as disappointing as have previous dental panaceas."

Pointing out that experiences with numerous "panaceas" advanced in the past have made the dental profession extremely wary of sweeping promises based on preliminary evidence, the *Journal* declared:

"The profession, rightfully, will withhold judgment on ammoniated dentifrices until clinical trial and carefully controlled studies have proved their worth."

Notes of Interest

Sydney E. Jaynes, D.M.D., M.S., wishes to announce the opening of his office in the Professional Building, Columbia, Missouri, practice limited to orthodontics.

Dr. Stanley G. Moore, orthodontist, wishes to announce the removal of his offices to 322 North Potomac Street, Hagerstown, Maryland.

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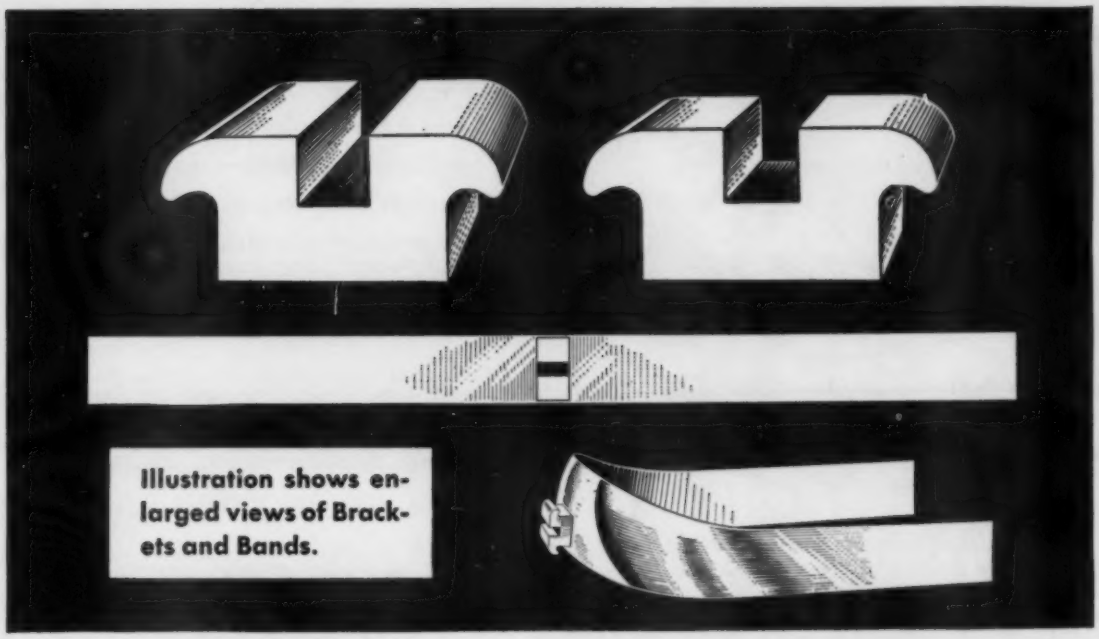

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Here is an integration of all available literature covering structure and mechanisms of formation of the teeth, the physiological factors which affect them, and the pathological processes which injure or destroy them. The methods of an exact science have been applied to the subject, and Dr. Leicester has reviewed all pertinent literature for the first time in book form.

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